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Understanding the rural-urban reading gap

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Education, skills and learning
Research papers

Understanding the rural - urban reading gap

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Statistics Canada

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Note of appreciation

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Summary

Students from urban schools in Canada performed significantly better in reading than students from rural schools, according to the Programme for International Student Assessment. The rural-urban reading gap was particularly large in Newfoundland and Labrador, Prince Edward Island, New Brunswick and Alberta.

Students in rural schools in Alberta, while not performing as well as their urban counterparts, had reading scores above the national average and better than urban students in some other provinces.

This study uses data from the Youth in Transition Survey (YITS) and the Programme for International Student Assessment (PISA) to examine the difference in reading performance between students in rural and urban schools and to investigate why the rural-urban reading gap exists in some provinces.

The study found that rural students were more likely than urban students to come from families with lower socio-economic backgrounds. The parents of rural students tend to be less well-educated and less likely to be employed in professional occupations, such as doctors, lawyers and bankers. These differences, however, do not explain the gap in performance between rural and urban students. Even if one were to compare rural and urban students whose parents had the same level of education and the same occupation, the reading difference would still remain.

Moreover, the rural-urban gap cannot be attributed to differences in rural and urban schools because, for the most part, rural and urban schools are much the same. In fact, Canadian students ranked high internationally, in part, because there are few significant differences between Canadian schools overall.[1]

Instead, this study shows that the difference between rural and urban reading performance is most strongly related to community differences. Relative to the urban communities, rural communities were characterised by lower levels of education, fewer jobs, and jobs that were, on average, lower earning and less likely to require a university degree. The rural-urban reading differences are linked to community differences in levels of adult education and the nature of work. The community characteristics are based on both the education and job level of the parents of all of the school's 15-year-olds, and on the educational and occupational characteristics of the adult population of the school's municipality.

While family background is important, it is the community background in which students learn that explains the rural-urban reading gap. That is, the child of someone in a professional occupation will likely perform well in either an urban or rural school, but will likely perform even better in an urban community. In fact, every child will likely do better in an urban community because of the nature of the urban labour market and the overall higher levels of education among the adults. It is important to note that, because changes in school factors would affect both rural and urban students, they are not likely to reduce the rural-urban gap.

Because changes that might reduce the reading gap between rural and urban communities are not short-term measures, the study examined a variety of school characteristics that were not reported at the highest levels in rural schools in order to identify which of these characteristics has a strong relationship with student achievement. After controlling for individual socio-economic background and community conditions, the most important of these school factors were disciplinary climate, student behaviour, student-teacher ratios, teacher support, offering of extracurricular activities, and teacher specialisation.

1. Introduction

Driven by rapid technological change and the globalisation of markets, the 21st century affords incredible opportunity to Canada. Policy makers at all levels in Canada are interested in ensuring that all Canadians, including Canadians living in rural areas, have the skills and knowledge to capitalise on this opportunity and the flexibility to adapt to change. Schools in rural areas play a key role in generating the required skills and knowledge, including the foundation skills that support and enable efficient learning in adulthood.

This study uses data from the Youth in Transition Survey (YITS) and the Programme for International Assessment (PISA) to measure the difference in reading performance between students in rural and urban schools in each province and to identify factors that may help to explain rural-urban differences. The study looks at some of the factors that help us to understand differences in the reading performance of rural and urban students and examines how differences in family, school and community environments relate to the rural-urban reading gap.

For this study, a preliminary analysis of rural and urban student populations was carried out to identify a set of variables that were consistently different for rural and urban student populations. These variables were then used to develop a model which could test which of the family, school, and community characteristics exerted the most influence in explaining the rural-urban reading gap. Because the most consistent differences between rural and urban students reflect the family and community background of students and are not subject to change in the short term (for example, parent's education), a second model was then developed to identify school characteristics that were not reported at the highest levels in rural schools in order to identify which of these characteristics has a strong relationship with student achievement.

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For the purposes of this analysis, schools were identified as urban or rural according to their location in or their proximity to large urban areas. Urban schools are those located in areas identified by Statistics Canada as Census Metropolitan Areas (CMA) and Census Agglomerations (CA). Schools in the remaining rural and small town areas (RST) were classified as rural.[2]

What is a rural school?

Rural schools are those located in *Rural and small town areas (RST)*. Rural and Small Town (RST) refers to the population living outside the commuting zone of Larger Urban Centres (LUCs) – specifically, outside Census Metropolitan Areas (CMA) and Census Agglomerations (CA). RST includes all municipalities with urban populations of 1,000 to 9,999 and rural areas, where less than 50 percent of the employed individuals commute to the urban core of a CMA/CA.

Urban schools are located in CMAs and CAs and are thus located in urban cores, together with adjacent rural and urban areas that have a high degree of economic and social integration with that urban area. A CMA has an urban core of 100,000 or over and includes all neighbouring municipalities where 50 percent or more of the labour force commutes to the urban core. A CA has an urban core of 10,000 to 99,999 and abides by the same commuting rule as a CMA.

This definition was chosen as the best representation of the urban or rural nature of the community to which 15-year-olds are exposed. Since this definition is based on actual commuting patterns, it reflects the degree to which 15-year-olds are likely to have access to an urban centre and the facilities, educational institutions, and labour market opportunities that it may provide.

For a full description of the rural definition, see Appendix B.

The Programme for International Student Assessment and the Youth in Transition Survey

In the spring of 2000, a broad sample of Canadian 15-year-olds participated in the Programme for International Student Assessment (PISA). PISA is a project developed by the Organisation for Economic Co-operation and Development (OECD) as a way to measure the skill levels of students in member countries and to understand what characteristics of students and schools influence the level and distribution of reading, mathematics and science skills among youth. In Canada, the study was carried out in conjunction with the Youth in Transition Survey (YITS), which collected information from students and parents about student characteristics and experience. PISA is administered in Canada through a partnership of the Council of Ministers of Education, Canada, Human Resources Development Canada and Statistics Canada.

What is PISA?

The Programme for International Student Assessment (PISA) is a collaborative effort among member countries of the Organisation for Economic Co-operation and Development (OECD) to assess regularly the performance of 15-year-olds in three domains—reading literacy, mathematical literacy and scientific literacy—through a common international test. Three PISA cycles have been planned, each one focussing on a different literacy domain. In 2000, the major focus was reading literacy, with mathematical and scientific literacy as minor domains. As a result, there were fewer mathematics and science items included in the assessment and these items were administered to a sub-sample of participants. Mathematical and scientific literacy will be the focus in 2003 and 2006, respectively.

Thirty-two countries participated in PISA 2000. In Canada, approximately 30,000 15-year-old students from more than 1,000 schools took part. A large Canadian sample was drawn so that information could be provided at both national and provincial levels.

The PISA 2000 survey included a direct assessment of students' skills through reading, mathematics and science tests as well as questionnaires collecting background information from students and school principals.

The first results for PISA 2000 are available in the report, *Measuring up: the Performance of Canada's youth in reading, mathematics and science – OECD PISA Study – First results for Canadians aged 15* (81-590-XIE). This publication is available electronically without charge, through the Internet at www.statcan.ca, www.pisa.gc.ca, and www.cmec.ca. In addition, the International OECD Report, *Knowledge and Skills for Life: First results from the OECD Programme for International Student Assessment*, is available on the OECD's website www.pisa.oecd.org.

What is YITS?

The Youth in Transition Survey (YITS) is a new Canadian longitudinal survey designed to examine the major transitions in young people's lives, particularly with respect to education, training and work. Survey results will provide a deeper understanding of the nature and causes of challenges young people face as they manage their transitions. The survey will help support policy planning and decision making that addresses these problems.

YITS will examine key transitions in the lives of youth, such as the transition from high school to postsecondary education and from schooling to the labour market. The factors that determine high school completion are examined, as well as the effects of school experiences on educational and occupational outcomes, and the contribution of

What is YITS?

work experience programs, part-time jobs and volunteer activities. To collect this information, current plans are to survey the same group of young people every two years, over a period of several years. The second survey cycle of YITS took place in 2002.

Two different age groups are participating in YITS, the 15-year-old cohort who also participated in PISA, and an 18- to 20-year-old cohort. The youth aged 18 to 20, who were surveyed in 2000 as part of the YITS project, did not participate in PISA. Results for the 18- to 20-year-old YITS cohort can be found in *At a Crossroads: First results for the 18 to 20-year-old cohort of the Youth in Transition Survey* (81-591-XIE, free) available through the Internet at www.statcan.ca and www.pisa.gc.ca.

2. Urban students outperform rural students in reading

In the PISA 2000 study, Canadian students performed very well by international standards. Canada scored near the top in reading performance. Only students in Finland performed significantly better than Canadian students in reading. Other countries that performed as well as Canada were New Zealand, Australia, Ireland, and Japan.[3]

While these results are noteworthy, rural students did not perform quite so well. At the national level, students from urban schools significantly outperformed students from rural schools in reading. In all provinces, except Nova Scotia and Manitoba, there were differences in the reading performance of rural and urban students. In only four of these provinces, Newfoundland and Labrador, Prince Edward Island, New Brunswick and Alberta, were the differences significant.[4] It is worth noting, however, that rural students in Alberta still performed well, exceeding the Canadian national average, and better than urban students in some other provinces.

Urban students significantly outperformed rural students in Newfoundland and Labrador, Prince Edward Island, New Brunswick and Alberta. However, rural students in Alberta still performed well, exceeding the national average and scoring better than urban students in some other provinces.

Figure 1

Mean reading scores for students in urban and rural schools compared to provincial averages

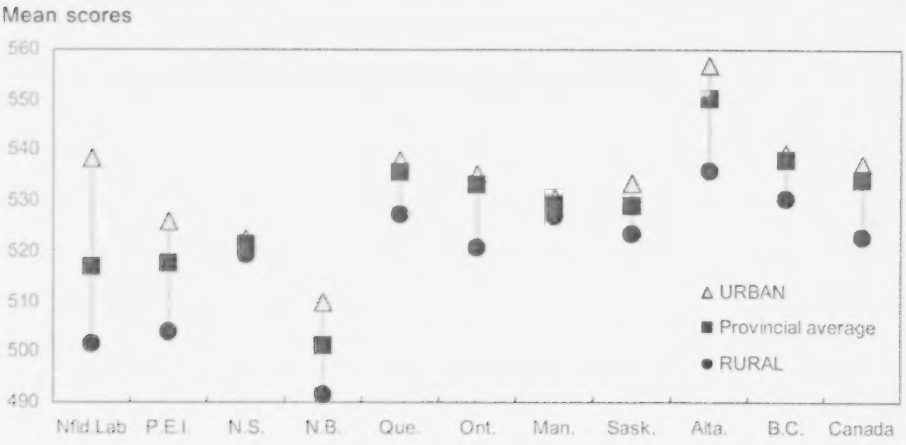


Table 1

Student performance in reading for rural and urban schools

	Reading Performance		
	Rural schools	Urban schools	Provincial average
Newfoundland and Labrador	**501**	**538**	517
Prince Edward Island	**504**	**526**	517
Nova Scotia	519	522	521
New Brunswick	**491**	**510**	501
Quebec	527	538	536
Ontario	520	535	533
Manitoba	527	531	529
Saskatchewan	523	533	529
Alberta	**536**	**557**	550
British Columbia	530	539	538
Canada	**523**	**538**	534

Note: Scores are standardized with an OECD mean of 500, and a standard deviation of 100. Where rural-urban differences in average scores are statistically significant with a 99% level of confidence, scores are bolded.

In the international context of the PISA study, students in all provinces performed well in reading literacy. In fact, all ten provinces performed above the OECD average (of 500). At the provincial level, students in Alberta performed significantly better than the Canadian average. Students in Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick, however, performed at levels significantly lower than the Canadian average.

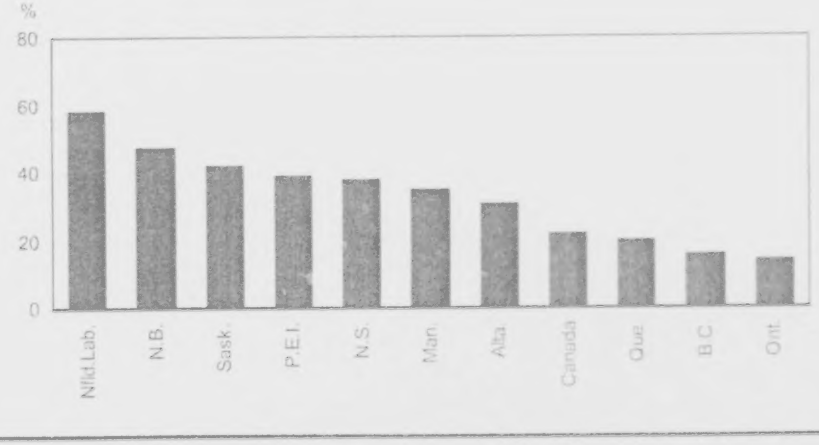
The performance of rural students generally followed the same geographic pattern as the overall provincial averages. However, while the overall provincial results for Nova Scotia were similar to the other Atlantic Provinces, the rural-urban difference in performance that appeared in Newfoundland and Labrador, Prince Edward Island and New Brunswick did not show up in Nova Scotia. In fact, results for Nova Scotian rural students were not significantly lower than for rural students in the rest of Canada. Again, Alberta stood out with an average reading performance for rural students significantly above the national rural average.

The existence of the rural-urban differences in reading performance in some provinces raises an important question: What are the characteristics of rural students, schools, and communities that can explain these lower results? In what ways are rural students different from urban students and which of these differences lies behind their lower performance? The first part of this analysis describes how rural and urban students and their environments differ (Section 3). This leads to a discussion of the characteristics of students, their families, schools and communities that best explain the different results for rural and urban students (Section 4). Finally, there is a discussion of school characteristics that were not reported at the highest levels in rural schools in order to identify which of these characteristics has a strong relationship with student achievement. (Section 5).

The relative size of rural populations varies by province. While 58% of Newfoundland and Labrador students were in rural schools, only about 15% of students in British Columbia and Ontario were in rural schools.

Figure 2

Percentage of students attending rural schools by province



The relative size of rural populations differs considerably by province. In Newfoundland and Labrador, over half of the 15-year-olds in the PISA study were in rural schools. Considering the low reading performance of these rural youth, it is clear that the overall provincial results are strongly influenced by the results of students in the rural schools. In Alberta, on the other hand, rural students, who also performed at levels significantly lower than their urban counterparts, represented less than one-third of the total student population and thus had a lesser impact on the overall provincial results.

The provinces with the largest proportion of rural students were Newfoundland and Labrador, New Brunswick and Saskatchewan. Urban student populations were the most dominant in Ontario, British Columbia and Quebec.

3. How do rural and urban students and schools differ?

The first stage in this analysis was an investigation of a variety of student, school and community characteristics to determine how rural and urban student populations differed and where those differences were consistent with differences in student reading performance. This information was then used in hypotheses about the determinants of the rural-urban reading gap.

Individual student behaviour

A variety of factors were available to describe student behaviours or the nature of students' relationships with others: reading behaviours, social communication with parents, student behaviour and discipline in the classroom (student group behaviours), student-teacher relationships and support from teachers. (See Appendix A for provincial data tables).

In terms of individual student behaviour and relationships with parents and teachers there were generally no differences between rural and urban students.

Generally, there were no systematic rural-urban differences in the variables that describe personal behaviours and relationships such as reading behaviours and social interaction with parents. Enjoyment of reading, for example, which showed a strong correlation with reading performance in the PISA study, was the same for rural and urban students in most provinces with two notable exceptions. In Newfoundland and Labrador and Alberta, rural students reported levels of reading enjoyment significantly lower than those of urban students.

For the most part, rural and urban students reported the same levels of social interaction with their parents. In addition, there was generally no difference in rural and urban student reports on the disciplinary environment of the school or the level of teacher support or student-teacher relations.

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Family background

Rural students were more likely to come from lower socio-economic backgrounds.

In all provinces, the parents of rural students had jobs with lower occupational status, on average, than did the parents of urban students[6]. The parents of rural students also had significantly lower levels of educational attainment than the parents of urban students, except in Ontario, Alberta, and British Columbia.

Rural students tended to come from homes with fewer cultural possessions and educational resources and they were less likely to discuss cultural, political or social issues with their parents.

The first results of PISA 2000 showed that the number of books in the home is an important indicator of reading performance possibly as a reflection of a home environment that encourages reading. In Newfoundland and Labrador, New Brunswick and Quebec, rural students reported significantly fewer books at home than did urban students, but elsewhere there was no difference in the proportion of students from homes with more books.

The nature of interactions with parents was also an important factor in reading performance. Students' reading performance generally benefited from parents with whom they could discuss books, television shows, and political or social issues (parental academic interest). This is noteworthy, as urban students reported higher levels of this kind of interaction with parents in Newfoundland and Labrador, Prince Edward Island, Quebec, Manitoba, and Alberta.

Urban students in most provinces reported significantly higher levels of home cultural possessions (such as classical literature, books of poetry and works of art) and educational resources (such as a dictionary, a quiet place to study, a desk, textbooks, and calculators). The exceptions were Nova Scotia and British Columbia. In Ontario, there was no significant difference in the presence of cultural possessions in the home and in Prince Edward Island there was no difference in levels of home educational resources.

Rural students were less likely to participate in cultural activities such as going to museums and attending concerts, likely because of access to cultural facilities. In most provinces, however, rural students were just as likely as urban students to participate in extracurricular activities at school and outside of school.[7]

Transportation

Rural students spent significantly longer getting to school in most provinces.

One variable of particular interest in this analysis because it is often cited in discussions about rural schooling was the amount of time students spent getting to school. Rural students in most provinces reported spending more time travelling to school than urban students. The only exceptions were Newfoundland and Labrador, Quebec and Alberta where there was no significant difference in the proportion of students with long commutes. The likelihood of longer transportation times varied by province for both rural and urban students. About one-quarter of rural students in most provinces reported a commute of 30 minutes or more. The only exceptions were Newfoundland and Labrador, where only 7% of rural students reported transportation times of that length, and Prince Edward Island, where fully 42% of students commuted 30 minutes or longer.

Fewer urban students reported such long commutes, but there was an even greater range by province. In Newfoundland and Labrador, Manitoba and British Columbia, fewer than 10% of urban students had commutes longer than 30 minutes. At the other extreme were urban students in Prince Edward Island and Alberta

where about one-quarter reported the longer commute times. [8] Overall, there was no consistent pattern between the differences in average transportation times and average reading performance for rural and urban jurisdictions.

Computer and Internet Use

While rural students were less likely to have access to computers and the Internet at home than urban students...

Rural students were less likely to have a computer or Internet access at home than urban students, but in most provinces the difference was small. Students in rural schools in Newfoundland and Labrador, New Brunswick and Quebec were the least likely to have a computer at home. The rural-urban difference was even higher in terms of access to the Internet. In Newfoundland and Labrador and Quebec, one half or fewer of rural students had Internet access at home. In contrast, the percentage of urban students with home Internet access ranged from 62% in Quebec to 79% in Alberta. The only provinces without large rural-urban difference in home Internet access were Nova Scotia and Ontario.

Figure 3

Rural students are less likely than urban students to have a computer at home

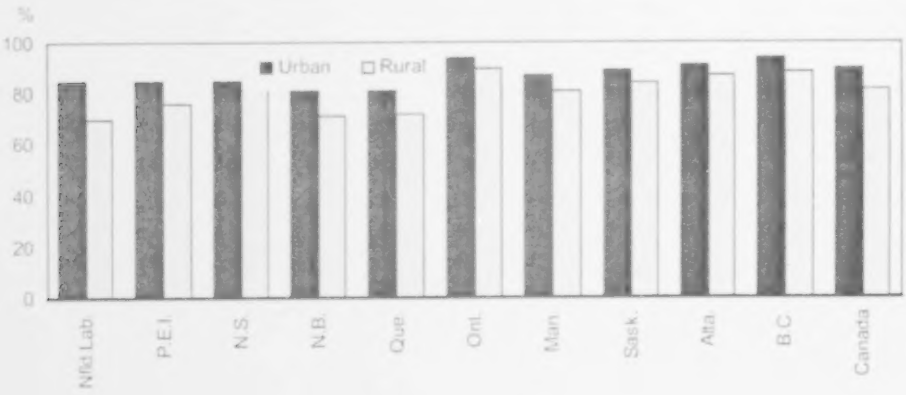
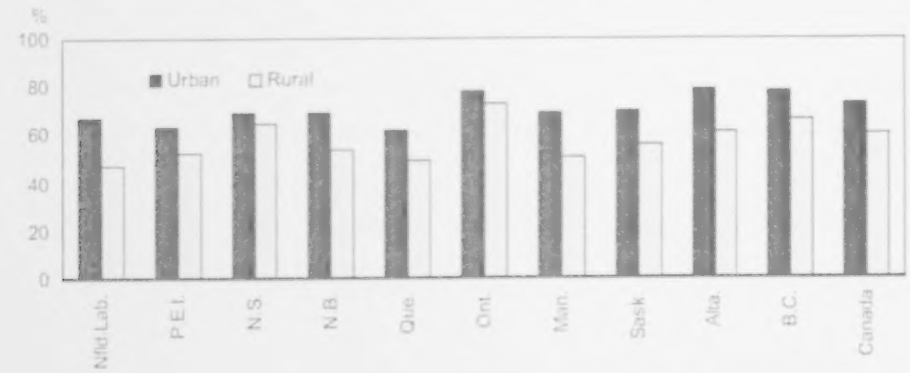


Figure 4

Rural students are even less likely to have access to the Internet at home



While rural students were less likely to have access to computers and the Internet at home, they actually made greater use of computers at school. A higher proportion of rural students than urban students used computers more than once a month at school. In Nova Scotia, Ontario and Quebec, this difference was not statistically significant. In Prince Edward Island, New Brunswick, Manitoba, Saskatchewan, and Alberta, rural students used the Internet at school significantly more often than urban students did.

they spent more time using a computer or the Internet at school than urban students did.

Education and career aspirations

Over 90% of Canadian 15-year-olds reported that they hope to get a postsecondary education. This is very high when one considers that, according to YITS, only 62% of 18 to 20-year-olds, who were no longer in high school in 2000, had gone on to postsecondary education (McMullen, Bowlby, 2002). Fully three-quarters of the 15-year-olds who would like to get a postsecondary education said they would like to get a university degree. To put this in context, of the 18- to 20-year-olds who had gone on to postsecondary institutions, only one-third actually attended a university in their first year.[9]

The vast majority of 15-year-olds would like to get some kind of postsecondary education.

The percentage of students who aspire to a postsecondary education was very high for both rural and urban students in all provinces (85% or more). Only in Prince Edward Island, Quebec and Manitoba were urban students significantly more likely to want to get a postsecondary education than rural students.

Rural-urban differences were more noticeable when it came to the decision to aim for a university rather than a college education. While the largest differences in university intentions were in Alberta and Quebec, only in Prince Edward Island were postsecondary preferences the same for both rural and urban students. In Quebec, there were particularly low rates of university intentions for both rural and urban students. This finding may be a reflection of the very different postsecondary education system that exists in Quebec where CEGEPs, the provincial system of community colleges which also provide a system of university preparation, play a very different role than colleges in the rest of Canada.

While most students, both rural and urban, aspire to a university education, the rate is significantly lower for rural students.

The rural-urban difference in the type of postsecondary education expected was also reflected in the career aspirations of students as measured by the occupational status of the job they expect to have when they are thirty years old. In all provinces, urban students had significantly higher career aspirations than rural students. As with educational aspirations, the career hopes of students in the Atlantic Provinces were not significantly different from those of other 15-year-olds across the country.

Rural students in all provinces also had significantly lower career expectations than urban students.

School characteristics

As part of the PISA assessment, principals were asked to report on the qualifications of teachers and to report on the extent to which teacher shortages and the adequacy of material and instructional resources hindered student learning. In terms of the percentage of mathematics, science and language arts teachers who have university level qualifications in their subject matter, in Newfoundland and Labrador, Manitoba, Saskatchewan and Alberta, urban school principals reported significantly higher

Rural and urban schools are actually much the same when it comes to resources and learning environments.

levels of teacher specialisation than rural principals. Only in Prince Edward Island were rural principals more likely to report that teacher shortages hindered student learning.

> This analysis is restricted to the schools that participated in the PISA study and the communities in which PISA participants went to school. The information on schools presented in this section was collected from questionnaires completed by the principals in the PISA sample of schools, that is, in schools attended by 15-year-olds. Community information was gathered from the Census for the communities where these schools were located. Because the PISA sample was developed to be representative of the population of 15-year-olds, the school information cannot be interpreted as representative of all schools, or all high schools, urban or rural. Nor is it representative of all rural and urban communities. This analysis describes, rather, the schools attended by the students in the study and their communities, and these characteristics are included primarily as possible factors influencing student performance, not as characteristics of urban or rural schools and communities overall.[10]

For the most part, there were no reported between the adequacy of resources in rural and urban schools. The exceptions were Quebec where principals were more likely to report that the school buildings were inadequate in urban schools, and Saskatchewan where principals reported that instructional resources were less adequate in rural schools than in urban schools.

Principals were also asked their perceptions of teacher morale and commitment and the degree to which they thought that negative teacher behaviour affected student learning. Although there was a great deal of variation in these measures between provinces, there was no clear trend with respect to urban–rural differences. Only in Saskatchewan and British Columbia did rural and urban principals report different measures of teacher morale and commitment. In Saskatchewan it was urban principals who reported the highest levels of teacher morale and commitment, and in British Columbia it was the rural principals.

Where there were differences between rural and urban schools, these were generally not consistent with the rural-urban reading gaps.

Overall, while there were some differences between rural and urban schools, these were not consistent with the rural-urban reading gaps. For example, reports of the proportion of teachers working in their area of specialisation differed significantly between rural and urban schools in some provinces with the large reading gaps and some with small or no reading gaps.

Community characteristics

While there were no consistent differences in the nature of schools in rural and urban communities, there were big differences in the characteristics of the communities themselves.

A variety of community characteristics were included in this analysis. These community variables were taken from the 1996 Census and PISA 2000. Although information from the 1996 Census does not reflect the conditions in the community at the time of the PISA assessment, it does provide an indication of the community that these students have likely been exposed to during their schooling. The analysis assumes that the community has not changed significantly in the four years between

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the 1996 Census and PISA 2000, and that the students have been exposed to that community in the interim. It also assumes that the aggregate characteristics of the parents of the 15-year-olds in the school are indicative of the community environment of the students.

This information describes the communities where the schools in the PISA study were located. This part of the analysis examined unemployment and employment rates, the percentage of white-collar workers in the community, education levels, individual and family income, and the percentage of young adults enrolled in postsecondary education.

Rural areas had higher unemployment rates.

As one would expect, there was a wide range in these community-level variables both between rural and urban areas and across the country. In all four Atlantic Provinces, the communities where rural schools were located had significantly higher rates of adult unemployment than the urban communities in the study. Elsewhere, the difference in unemployment rates in the PISA communities was not as pronounced. In Manitoba, the communities where rural schools were located actually had lower unemployment rates than communities with urban schools.

There were more notable differences in employment rates, which indicate the percentage of adults with jobs and therefore account not only for differences in the number of adults looking for work (unemployed), but also those who are not participating in the labour force at all. In all provinces except Prince Edward Island, Alberta, and British Columbia, adults in rural communities in the study were less likely to have a job than those in urban communities.

The differences in economic conditions of rural and urban communities were also indicated by the average individual and family income of the communities in the study. In most provinces, average individual income and average family incomes were higher in the communities where urban schools were located.[11]

Adults in rural communities had less education and fewer of them had jobs requiring a university degree.

Adult populations in the areas where urban schools were located had higher levels of educational attainment in all provinces. The urban communities had higher proportions of adults with both any postsecondary education and specifically university education. These rates were also reflected in the proportion of jobs in the communities that typically require university education. Between 40% and 50% of the workforce in the urban communities were in these white-collar jobs. In all provinces, by contrast, less than 40% of jobs in the rural communities required university training. Only in Quebec was there no rural-urban difference in this white-collar employment rate.

The last community-level indicator included in this analysis was the percentage of young adults in the community who were enrolled in postsecondary education. This does not necessarily indicate the presence of a postsecondary institution in the community as the Census includes many students in the family home even when they are away at school. It does, however, provide some indication of the nature of postsecondary participation for youth in the community. In all four Atlantic Provinces and Saskatchewan, the rural communities in the study had the same proportions of youth enrolled in postsecondary institutions as the urban communities. Prince Edward Island, Manitoba and Alberta had the lowest rates of youth postsecondary participation in rural communities, and Quebec, Nova Scotia, Newfoundland and Labrador, and Ontario had the highest.

4. What rural characteristics lie behind the difference in reading performance?

The difference in some provinces between the performance of students in rural and urban schools is not related to differences in the schools (which are few) but rather to differences in the nature of work found in rural and urban communities.

The first temptation when comparing student performance from different regions is to look to the schools to find out what it is about the education system that can explain differing results. The initial analysis of rural-urban differences in this report demonstrated, however, that the data collected in PISA show that while there are some differences between rural and urban schools, they do not reflect the rural-urban reading differences.

There were, however, a number of variables that differed significantly between rural and urban communities. An examination of these variables showed that, in fact, the rural-urban difference in reading performance that exists in some provinces is best explained by differences in the kinds of jobs in the communities where these schools were located, specifically in the education-level required by those jobs.

In order to determine which factors best explain the difference between the reading performance of rural and urban students, the actual reading averages of rural students in each province were compared with the averages they would have attained if there were no rural-urban difference in a variety of important individual, family, school and community factors. For example, after estimating the relationship between parental education and individual performance, it is possible to calculate the expected individual performance corresponding to various levels of parental education. Using this technique, this analysis calculates what the average performance of students in rural areas would be if their families, schools, and communities had the average characteristics of the urban areas in their provinces.

While individual and family characteristics explain some of the rural-urban difference in student reading performance, their explanatory value is small.

The first phase in this analysis looked at the relationship between a combination of important individual and family factors and the rural-urban gap. The results, shown in Table B1, indicate that while individual and family characteristics explain some of the rural-urban difference in student reading performance, their explanatory value is small. When the differences in individual and family factors are taken into account, there remains a large, systematic difference between rural and urban students that still needs to be explained. That is, controlling for the family background of individual students, rural students still show lower reading scores.

Column 1 shows the size of the rural-urban gap between the actual reading performance of students in rural and urban schools (a negative number means that rural student performance is lower by the number indicated). Column 2 shows the size of the difference that remains after controlling for individual students' socio-economic status – that is, the difference between actual reading performance of urban students and the expected performance of rural students if they had the same family socio-economic characteristics as their urban counterparts (parental education and occupational status at the individual level).

In the provinces where there is a substantial difference in the performance of students in rural and urban schools, only a small part of this difference is explained by the differences in socio-economic status at the student level. This means that one cannot attribute the rural-urban difference in performance solely to differences in the socio-economic status of individual students. Urban students would still be expected to perform better than rural students even if their parents had the same

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education and similar jobs. In spite of the strong effect of a student's family socio-economic status on reading performance found in the first results of PISA, there are other important factors at play in explaining the difference in rural and urban results.

Measures of family and community background

This analysis examined a variety of variables related to family background (socio-economic status) of students, as well as the characteristics of the communities where their schools were located. Variables describing the socio-economic background of students' families were the highest occupational status and the highest level of education of students' parents. The occupational status of parents was derived using the International Socio-economic Index of Occupational Status (see Appendix B for definition).

As measures of the community environment of students, the analysis examined average occupational and educational status of the parents of 15-year-olds in the school, average income, employment rates, unemployment rates, the proportion of adults with postsecondary education, and specifically with university education, and the proportion of adults working in jobs that generally require university qualifications (white collar jobs).

Differences between rural and urban communities best explain the differences in rural and urban reading performance.

The second phase in this analysis looked at the relationship between a variety of community factors and the remaining rural-urban gap. To do this, a model was developed that looked at the individual and combined effect of a variety of important community variables such as community employment rates, the average educational attainment of the adult population, and the average education and occupational status of all the parents of the 15-year-olds in the school. This model confirmed that differences between rural and urban communities best explain the differences in rural and urban reading performance. More specifically, community characteristics related to adult education levels have the strongest relationship with the rural-urban gap.

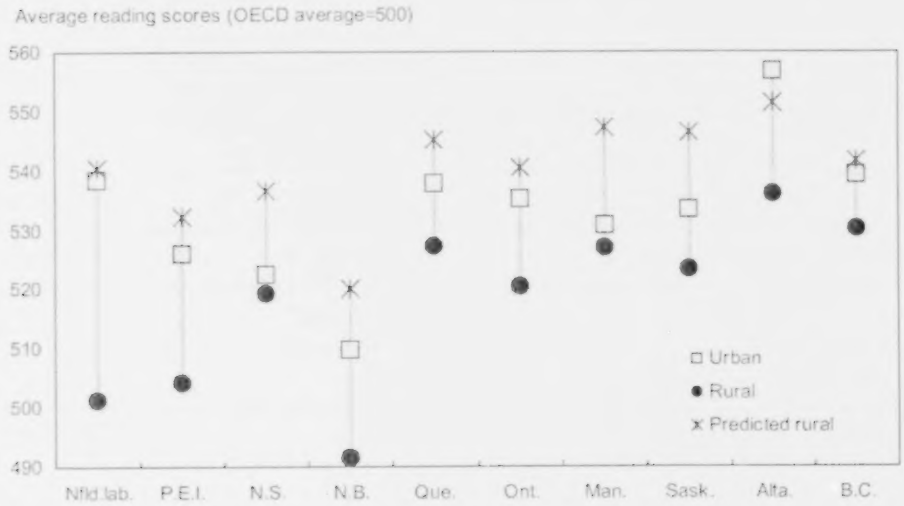
Column 3 of Table B1 shows the remaining difference after controlling for these community variables as well as individual socio-economic status (parental occupation and educational attainment). In all provinces, except Alberta, the rural-urban difference disappeared completely once community variables related to adult educational attainment were controlled for. In fact, after controlling for the community level variables, rural students were actually expected to outperform students from urban schools. This means that if the rural communities had these same characteristics as urban communities in the same province, rural students would be expected to score higher than urban students.

In all provinces, the relative impact of these variables is considerable. A comparison of the difference that remains after controlling for individual socio-economic status and the difference after further controlling for the community variables reveals that the community factors far outweigh individual student socio-economic status in accounting for the difference in rural and urban student performance. For example,

in Alberta, where there is an actual difference of 21 points between rural and urban students, when individual socio-economic status is controlled for, there is still a difference of 17 points. However, when the combination of community variables is taken into account, this difference shrinks to only 5 points.

Figure 5

Controlling for the difference in family and community background, students in rural schools would actually outperform their urban counterparts in most provinces



Note: Predicted rural achievement is the expected average performance of students in rural schools when we control for family background as well as a combination of community variables related to average employment rates, occupational status, and educational attainment. For a comparison of the effects of individual SES and community factors see Table B1.

The average occupational status of the parents of the 15-year-olds in the school is the factor with the strongest relationship with the rural-urban difference in reading performance.

An examination of the variables that contribute to this model reveals that the average occupational status of the parents of the 15-year-olds in the school is the factor with the strongest relationship with the rural-urban difference in reading performance. Columns 4 to 10 show the size of the differences after controlling for the impact of the community factors one at a time. In all provinces, when just aggregate parental occupational status is controlled for, rural students perform about as well as or better than urban students. Other important community characteristics that contribute to the rural-urban gap are the average educational attainment of adults, the proportion of adults with postsecondary education (and more specifically university education), and the proportion of workers whose jobs require university training. Community average employment rates and average income had smaller or larger effects depending on the province. In general, these variables are all related to the education-level of jobs in the community. While it is unlikely that any of these variables directly causes lower student achievement, they are indicators of the environment in which these students learn and look for support for their learning. In

general, they may be a visible measure of the degree to which higher education pays off in the community.

Further analysis is required for a full understanding of the relationship between these community characteristics and student performance. To what extent do education levels of adults in the community reflect the availability of role models who demonstrate the value of education? To what extent do they reflect the availability of career options that require further education? These questions and others have yet to be answered. This study was intended as a means of investigating the rural-urban difference with a variety of variables available from YITS/PISA. Other variables available both from the YITS/PISA database can provide more detailed information about how the community level variables interact with students education and career expectations, family background and parental expectations, as well as peer influence. Furthermore, information collected in 2002 when these students were 17 years old will provide an additional set of information on factors influencing decisions about education and labour market choices.

5. Schools matter

This analysis found that the difference between rural and urban reading performance is most strongly related to community differences in adult education levels and the nature of work in rural communities. Reducing the difference in rural-urban reading performance is a long-term project that requires a full understanding of the relationship between community education levels and student performance. The rural-urban gap is not related to differences in rural and urban schools because, for the most part, rural and urban schools are much the same

There are a number of school variables which were not reported at the highest levels and which were associated with high student achievement.

Although there are few differences between rural and urban schools, not all school variables were reported at maximum levels by either rural or urban principals. This analysis concludes by identifying which of the school characteristics not reported at maximum levels in rural schools have a strong relationship with student achievement after controlling for individual socio-economic background and community factors.

School characteristics related to school size and structure, school resources, teacher qualifications and training, and school discipline were included. Values associated with high student performance for each of these variables were specified based on the observed relationships with student performance in PISA 2000. For example, the percentage of teachers with university qualifications in their instructional area was set at 100%. For variables derived as indices (such as *student behaviour* and *teacher morale and commitment)* the value was equivalent to there being no reports of problems for the questions which make up the indices. (See Appendix C for a description of the values used).

The analysis then estimated how well students in rural schools in each province would be expected to perform if all of the school principals had reported the maximum value for the questions that make up each of the selected variables. For example, what would the average reading performance of rural students have been if none of the principals had reported that poor school resources were hindering student learning?

It should be noted that the use of these variables in the model does not imply that these are the critical school factors governing student performance. There are likely many other factors that are already reported at high levels that may have a greater impact on student performance if the reported values were reduced. Furthermore, the are a great many school factors for which no information was available from the YITS/PISA survey.

After controlling for individual socio-economic background and community conditions, the most important of these school factors were disciplinary climate, student behaviour, student-teacher ratio, teacher support, offering of extracurricular activities, and teacher specialisation.

There were a number of specific factors which, when modelled at their maximum values, were associated with higher average reading performance for rural students (Table C1).[12] The most important of these school factors, after controlling for individual socio-economic background and community conditions, were disciplinary climate, student behaviour, student-teacher ratio, teacher support, offering of extracurricular activities, and teacher specialisation.

When the effects of a variety of combinations of school variables were examined, the model showed that a specific combination of four school characteristics was associated with the highest student performance: disciplinary climate, student behaviour, student teacher ratios, and availability of school activities. It is important to note that because changes in school factors would affect both rural and urban students, they would not likely reduce the rural-urban gap.

Other school characteristics were examined in this analysis, including achievement press, teacher professional development, total hours of instruction, negative teacher behaviour, school autonomy, teacher participation in decision making, teacher morale, and computer availability. However, the effects of these variables on performance were either inconsistent or inadequately described by the statistical model in this analysis.

Conclusions

This analysis of the reading performance of students in rural and urban schools showed that the rural students did not perform as well as their urban counterparts nationally, and particularly in Newfoundland and Labrador, Prince Edward Island, New Brunswick and Alberta. These rural-urban differences are primarily related to differences between rural and urban communities, in particular, the average educational attainment of adults in the community, community employment rates, the educational requirements and earning capacity of jobs in the community.

How the community context actually has an impact on student performance is a question for further analysis. For the moment, one can only theorise. It may be that students do better when there is a critical mass of highly educated role models in the community who demonstrate the value of learning. Or it may be simply that students apply themselves as hard as they feel they need to – they learn as much as they feel they need to learn. If there are fewer jobs in their community that require higher skills and higher levels of education, then there may no clear incentive for students to push themselves that much harder. More work needs to be done to understand the impact of community characteristics, family background, and students educational and career aspirations on academic performance. Moreover, this analysis can be extended to an investigation of how these community or neighbourhood effects influence student performance in all communities, including smaller cities, which, like rural areas, may have less educated work forces and limited career opportunities.

Even after considering the effects of community characteristics, there are many school characteristics that strongly influence student performance. There are a number of school variables which were not reported at the highest levels and which were associated with high student achievement. After controlling for individual socio-economic background and community conditions, the most important of these school factors were disciplinary climate, student behaviour, student-teacher ratios, teacher support, offering of extracurricular activities, and teacher specialisation. This analysis did not include an exhaustive set of school and community characteristics that might influence student performance, nor did the analysis identify which school factors matter the most to educational outcomes. Further research is required in order to provide an understanding of how community factors influence student performance and exactly how certain school characteristics tend to mitigate the effect of these community factors.

APPENDIX A: Tables

Table A1a
Newfoundland and Labrador
Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	**501**	***3.3***	**538**	***5.0***	517	*2.8*
Mathematics achievement	**500**	***3.3***	**522**	***5.2***	509	*3.0*
Science achievement	**504**	***4.0***	**534**	***5.5***	516	*3.4*
Student cultural activities	**-0.28**	***0.03***	**0.06**	***0.05***	-0.14	*0.02*
Reading enjoyment	**-0.15**	***0.03***	**0.04**	***0.05***	-0.07	*0.03*
Homework - students doing 4 or more hours per week (%)	41.0	*1.7*	45.0	*2.3*	43.0	*1.4*
Career expectations	**60.2**	***0.6***	**64.6**	***0.9***	62.0	*0.6*
Percentage of students who expect to get postsecondary education (%)	90.0	*1.1*	93.0	*1.1*	91.0	*0.7*
Percentage of students who expect to get university rather than college (%)	**76.0**	***1.3***	**86.0**	***1.6***	81.0	*1.0*
Percentage of student with 30 minutes or more transportation time (%)	7.0	*0.8*	7.0	*1.1*	7.0	*0.6*
Students participating in school extracurricular activities (%)	**61.0**	***1.5***	**49.0**	***2.2***	56.0	*1.3*
Students participating in non-school extracurricular activities (%)	57.0	*1.6*	62.0	*1.9*	59.0	*1.1*
Using computer at school at least several times per month (%)	**63.0**	***1.6***	**55.0**	***2.4***	60.0	*1.3*
Using internet at school at least several times per month (%)	58.0	*1.7*	54.0	*2.4*	56.0	*1.4*
Family characteristics						
Family socio-economic status	**43.6**	***0.4***	**53.1**	***0.7***	47.6	*0.4*
Highest parent educational attainment	**5.2**	***0.0***	**5.6**	***0.0***	5.4	*0.0*
Students with 100 or more books at home (%)	**78.0**	***1.1***	**84.0**	***1.7***	81.0	*0.9*
Parental academic interest	**-0.16**	***0.03***	**0.08**	***0.04***	-0.06	*0.02*
Parental social interest	-0.04	*0.03*	-0.03	*0.04*	-0.04	*0.03*
Home cultural possessions	**-0.16**	***0.03***	**0.15**	***0.05***	-0.03	*0.03*
Home educational resources	**0.12**	***0.03***	**0.27**	***0.03***	0.18	*0.02*
Computer at home (%)	**69.9**	***1.1***	**85.2**	***1.7***	76.2	*1.0*
Internet access at home (%)	**46.7**	***1.5***	**67.1**	***2.1***	55.1	*1.3*
Student's school experience						
Disciplinary climate	0.15	*0.03*	0.12	*0.04*	0.14	*0.02*
Teacher-student relations	0.41	*0.04*	0.52	*0.04*	0.45	*0.03*
Teacher support	0.42	*0.04*	0.45	*0.04*	0.43	*0.03*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A1b

Newfoundland and Labrador

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	93.04	*(0.73)*	95.87	*(0.97)*	93.81	*(0.61)*
Number of 15-year-olds	**78.34**	***(5.70)***	**157.75**	***(12.37)***	100.00	*(6.40)*
K to 12 schools (%)	**21.16**	***(4.85)***	**0.00**	***(0.00)***	15.39	*(3.64)*
Negative teacher behaviours	-0.14	*(0.09)*	-0.32	*(0.17)*	-0.19	*(0.08)*
Negative student behaviours	0.38	*(0.09)*	0.25	*(0.12)*	0.35	*(0.07)*
Teacher morale	-0.01	*(0.12)*	0.08	*(0.23)*	0.01	*(0.10)*
Student-teacher ratio	**14.96**	***(0.34)***	**16.94**	***(0.45)***	15.57	*(0.29)*
Inadequacy of instructional resources	0.55	*(0.11)*	0.17	*(0.17)*	0.45	*(0.09)*
Shortage of teachers	0.58	*(0.12)*	0.64	*(0.22)*	0.59	*(0.11)*
Professional development (%)	50.96	*(5.03)*	68.75	*(7.36)*	55.71	*(4.24)*
Inadequacy of material resources	0.00	*(0.12)*	-0.39	*(0.15)*	-0.11	*(0.10)*
Computer availability	6.14	*(0.26)*	6.77	*(0.46)*	6.33	*(0.23)*
Teacher specialization (%)	**70.99**	***(2.65)***	**87.82**	***(3.62)***	75.48	*(2.29)*
School autonomy	-0.55	*(0.08)*	-0.31	*(0.10)*	-0.48	*(0.06)*
Teacher participation to decision making	-0.05	*(0.13)*	-0.19	*(0.17)*	-0.09	*(0.10)*
Community characteristics						
Population density	**97.89**	***(12.01)***	**368.82**	***(77.99)***	171.78	*(25.78)*
Adult unemployment rate	**29.77**	***(1.28)***	**12.54**	***(0.51)***	25.07	*(1.22)*
Adult employment rate	**35.79**	***(1.13)***	**52.98**	***(1.00)***	40.48	*(1.16)*
White collar employment	**33.23**	***(1.32)***	**49.13**	***(1.42)***	37.57	*(1.26)*
Post-secondary enrollment	61.10	*(1.91)*	66.69	*(1.37)*	62.62	*(1.45)*
Post-secondary education	**38.93**	***(1.08)***	**55.45**	***(1.03)***	43.43	*(1.11)*
University education	**14.13**	***(0.58)***	**26.88**	***(1.33)***	17.61	*(0.80)*
Average income ($)	**16,727**	***(542)***	**22,904**	***(496)***	18,412	*(500)*
Average family income ($)	**36,365**	***(1,204)***	**50,785**	***(965)***	40,298	*(1,119)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A2a
Prince Edward Island
Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	**504**	***3.8***	**526**	***3.2***	517	*2.4*
Mathematics achievement	508	*4.6*	514	*4.4*	512	*3.7*
Science achievement	497	*5.0*	515	*4.0*	508	*2.7*
Student cultural activities	**-0.29**	***0.03***	**0.09**	***0.03***	-0.06	*0.02*
Reading enjoyment	-0.11	*0.05*	-0.04	*0.04*	-0.07	*0.03*
Homework - students doing 4 or more hours per week (%)	21.0	*1.5*	24.0	*1.4*	23.0	*1.0*
Career expectations	**58.7**	***0.8***	**62.8**	***0.6***	61.2	*0.5*
Percentage of students who expect to get postsecondary education (%)	**87.0**	***1.4***	**92.0**	***1.0***	90.0	*0.8*
Percentage of students who expect to get university rather than college (%)	83.0	*1.7*	88.0	*1.2*	86.0	*1.0*
Percentage of student with 30 minutes or more transportation time (%)	**42.0**	***1.7***	**26.0**	***1.3***	32.0	*1.0*
Students participating in school extracurricular activities (%)	60.0	*1.9*	64.0	*1.6*	63.0	*1.2*
Students participating in non-school extracurricular activities (%)	65.0	*1.9*	71.0	*1.6*	69.0	*1.2*
Using computer at school at least several times per month (%)	**61.0**	***2.0***	**42.0**	***1.7***	50.0	*1.3*
Using internet at school at least several times per month (%)	**54.0**	***1.9***	**37.0**	***1.6***	44.0	*1.3*
Family characteristics						
Family socio-economic status	**45.4**	***0.7***	**52.2**	***0.6***	49.5	*0.5*
Highest parent educational attainment	**5.3**	***0.0***	**5.6**	***0.0***	5.5	*0.0*
Students with 100 or more books at home (%)	74.0	*1.6*	78.0	*1.3*	77.0	*1.0*
Parental academic interest	**-0.19**	***0.04***	**-0.05**	***0.03***	-0.11	*0.02*
Parental social interest	**-0.39**	***0.04***	**-0.24**	***0.03***	-0.30	*0.02*
Home cultural possessions	**-0.46**	***0.04***	**-0.23**	***0.03***	-0.32	*0.03*
Home educational resources	-0.20	*0.05*	-0.11	*0.04*	-0.14	*0.03*
Computer at home (%)	**75.9**	***1.8***	**84.9**	***1.3***	81.4	*1.1*
Internet access at home (%)	**52.2**	***2.4***	**63.4**	***1.5***	59.1	*1.4*
Student's school experience						
Disciplinary climate	0.18	*0.03*	0.15	*0.03*	0.16	*0.02*
Teacher-student relations	0.26	*0.04*	0.32	*0.04*	0.29	*0.02*
Teacher support	0.41	*0.04*	0.32	*0.03*	0.35	*0.02*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A2b

Prince Edward Island

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	94.04	*(3.08)*	97.64	*(0.59)*	95.91	*(1.52)*
Number of 15-year-olds	117.64	*(19.05)*	188.07	*(22.02)*	154.16	*(15.94)*
K to 12 schools (%)	4.89	*(6.23)*	2.73	*(4.52)*	3.77	*(3.73)*
Negative teacher behaviours	-0.14	*(0.15)*	0.32	*(0.24)*	0.10	*(0.15)*
Negative student behaviours	0.75	*(0.30)*	0.66	*(0.24)*	0.70	*(0.19)*
Teacher morale	1.06	*(0.21)*	0.57	*(0.15)*	0.80	*(0.13)*
Student-teacher ratio	18.14	*(0.51)*	18.61	*(0.50)*	18.34	*(0.35)*
Inadequacy of instructional resources	0.45	*(0.22)*	-0.15	*(0.26)*	0.13	*(0.18)*
Shortage of teachers	**1.69**	***(0.35)***	**0.55**	***(0.15)***	1.09	*(0.21)*
Professional development (%)	**97.41**	***(3.35)***	**63.88**	***(10.59)***	78.99	*(6.80)*
Inadequacy of material resources	0.05	*(0.21)*	-0.60	*(0.15)*	-0.29	*(0.14)*
Computer availability	5.42	*(1.07)*	8.55	*(0.75)*	6.80	*(0.76)*
Teacher specialization (%)	61.70	*(5.99)*	59.19	*(5.59)*	60.20	*(4.04)*
School autonomy	-0.64	*(0.11)*	-0.37	*(0.09)*	-0.50	*(0.07)*
Teacher participation to decision making	-0.46	*(0.21)*	-0.13	*(0.12)*	-0.29	*(0.12)*
Community characteristics						
Population density	**219.50**	***(79.47)***	**553.40**	***(78.70)***	392.63	*(63.87)*
Adult unemployment rate	**15.01**	***(1.10)***	**10.37**	***(0.30)***	12.60	*(0.71)*
Adult employment rate	56.82	*(1.70)*	59.41	*(0.54)*	58.16	*(0.88)*
White collar employment	**28.22**	***(2.71)***	**43.70**	***(1.08)***	36.25	*(2.06)*
Post-secondary enrollment	52.23	*(3.28)*	61.30	*(1.64)*	56.93	*(1.97)*
Post-secondary education	**40.12**	***(2.08)***	**55.48**	***(1.43)***	48.09	*(1.94)*
University education	**16.16**	***(1.01)***	**28.63**	***(1.52)***	22.62	*(1.52)*
Average income ($)	**18,191**	***(331)***	**21,442**	***(206)***	19,876	*(370)*
Average family income ($)	**42,749**	***(1,115)***	**48,610**	***(464)***	45,788	*(814)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A3a
Nova Scotia
Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	519	*3.3*	522	*3.5*	521	*2.3*
Mathematics achievement	512	*3.7*	513	*4.3*	513	*2.8*
Science achievement	514	*5.0*	517	*4.0*	516	*3.0*
Student cultural activities	**0.04**	***0.04***	**0.18**	***0.03***	0.13	*0.02*
Reading enjoyment	0.11	*0.04*	0.02	*0.04*	0.06	*0.03*
Homework - students doing 4 or more hours per week (%)	28.0	*1.6*	26.0	*1.4*	27.0	*0.9*
Career expectations	**60.2**	***0.6***	**64.0**	***0.6***	62.6	*0.4*
Percentage of students who expect to get postsecondary education (%)	90.0	*1.0*	93.0	*0.8*	92.0	*0.6*
Percentage of students who expect to get university rather than college (%)	**79.0**	***1.6***	**88.0**	***1.0***	85.0	*0.8*
Percentage of student with 30 minutes or more transportation time (%)	**25.0**	***1.4***	**12.0**	***1.0***	17.0	*0.8*
Students participating in school extracurricular activities (%)	60.0	*1.8*	60.0	*1.9*	60.0	*1.2*
Students participating in non-school extracurricular activities (%)	66.0	*1.5*	67.0	*1.6*	67.0	*1.1*
Using computer at school at least several times per month (%)	49.0	*1.6*	46.0	*1.5*	48.0	*1.1*
Using internet at school at least several times per month (%)	47.0	*1.5*	44.0	*1.4*	45.0	*1.0*
Family characteristics						
Family socio-economic status	**49.1**	***0.5***	**53.3**	***0.6***	51.7	*0.4*
Highest parent educational attainment	**5.3**	***0.0***	**5.5**	***0.0***	5.4	*0.0*
Students with 100 or more books at home (%)	84.0	*1.1*	82.0	*1.2*	83.0	*0.8*
Parental academic interest	0.04	*0.03*	0.14	*0.03*	0.10	*0.02*
Parental social interest	**-0.29**	***0.04***	**-0.15**	***0.03***	-0.21	*0.02*
Home cultural possessions	-0.16	*0.03*	-0.06	*0.03*	-0.10	*0.02*
Home educational resources	-0.03	*0.04*	0.02	*0.03*	0.00	*0.02*
Computer at home (%)	81.7	*1.2*	85.3	*1.3*	83.9	*0.9*
Internet access at home (%)	65.4	*1.6*	69.1	*1.2*	67.6	*1.0*
Student's school experience						
Disciplinary climate	0.17	*0.03*	0.23	*0.04*	0.21	*0.03*
Teacher-student relations	0.40	*0.03*	0.38	*0.03*	0.39	*0.02*
Teacher support	0.37	*0.03*	0.39	*0.04*	0.39	*0.02*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools

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Table A3b

Nova Scotia

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	94.76	*(1.03)*	95.19	*(0.70)*	94.98	*(0.62)*
Number of 15-year-olds	**118.60**	***(9.51)***	**170.72**	***(10.25)***	144.89	*(7.40)*
K to 12 schools (%)	6.00	*(3.24)*	0.59	*(1.03)*	3.26	*(1.70)*
Negative teacher behaviours	-0.17	*(0.14)*	-0.05	*(0.10)*	-0.11	*(0.08)*
Negative student behaviours	0.39	*(0.11)*	0.38	*(0.09)*	0.38	*(0.07)*
Teacher morale	-0.20	*(0.14)*	0.03	*(0.13)*	-0.09	*(0.10)*
Student-teacher ratio	16.62	*(0.30)*	16.61	*(0.46)*	16.61	*(0.28)*
Inadequacy of instructional resources	0.69	*(0.13)*	0.44	*(0.10)*	0.57	*(0.08)*
Shortage of teachers	0.87	*(0.16)*	0.68	*(0.13)*	0.77	*(0.10)*
Professional development (%)	82.69	*(3.98)*	86.10	*(3.30)*	84.37	*(2.58)*
Inadequacy of material resources	0.36	*(0.14)*	0.09	*(0.10)*	0.23	*(0.09)*
Computer availability	5.98	*(0.46)*	6.36	*(0.44)*	6.18	*(0.32)*
Teacher specialization (%)	72.05	*(3.40)*	70.50	*(3.41)*	71.28	*(2.40)*
School autonomy	-0.19	*(0.08)*	-0.19	*(0.09)*	-0.19	*(0.06)*
Teacher participation to decision making	-0.26	*(0.11)*	-0.11	*(0.10)*	-0.19	*(0.07)*
Community characteristics						
Population density	**260.31**	***(42.30)***	**485.16**	***(72.18)***	373.75	*(43.18)*
Adult unemployment rate	**13.13**	***(0.83)***	**9.74**	***(0.65)***	11.42	*(0.55)*
Adult employment rate	**48.85**	***(0.84)***	**56.26**	***(1.37)***	52.59	*(0.88)*
White collar employment	**37.12**	***(1.18)***	**46.23**	***(1.01)***	41.71	*(0.89)*
Post-secondary enrollment	62.48	*(1.19)*	64.54	*(0.53)*	63.52	*(0.65)*
Post-secondary education	**48.53**	***(1.43)***	**56.18**	***(1.19)***	52.39	*(0.99)*
University education	**20.80**	***(1.66)***	**28.59**	***(1.31)***	24.73	*(1.11)*
Average income ($)	**19,936**	***(307)***	**23,383**	***(515)***	21,675	*(342)*
Average family income ($)	**42,661**	***(768)***	**50,293**	***(1,161)***	46,512	*(785)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A4a

New Brunswick

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	**491**	***2.5***	**510**	***2.6***	501	*1.8*
Mathematics achievement	503	*3.2*	509	*3.0*	506	*2.2*
Science achievement	**489**	***3.2***	**504**	***3.1***	497	*2.3*
Student cultural activities	**-0.11**	***0.03***	**0.04**	***0.03***	-0.03	*0.02*
Reading enjoyment	-0.02	*0.03*	0.05	*0.03*	0.02	*0.02*
Homework - students doing 4 or more hours per week (%)	**24.0**	***1.0***	**29.0**	***1.4***	27.0	*0.9*
Career expectations	**58.5**	***0.5***	**63.2**	***0.5***	60.9	*0.4*
Percentage of students who expect to get postsecondary education (%)	87.0	*1.0*	90.0	*0.8*	89.0	*0.6*
Percentage of students who expect to get university rather than college (%)	**77.0**	***1.1***	**84.0**	***1.0***	81.0	*0.8*
Percentage of student with 30 minutes or more transportation time (%)	**25.0**	***1.1***	**20.0**	***1.2***	22.0	*0.8*
Students participating in school extracurricular activities (%)	52.0	*1.2*	54.0	*1.2*	53.0	*0.8*
Students participating in non-school extracurricular activities (%)	**57.0**	***1.3***	**65.0**	***1.4***	61.0	*1.0*
Using computer at school at least several times per month (%)	**45.0**	***1.2***	**31.0**	***1.4***	37.0	*1.0*
Using internet at school at least several times per month (%)	**41.0**	***1.3***	**28.0**	***1.4***	34.0	*1.0*
Family characteristics						
Family socio-economic status	**46.3**	***0.4***	**53.2**	***0.5***	50.0	*0.4*
Highest parent educational attainment	**5.2**	***0.0***	**5.5**	***0.0***	5.4	*0.0*
Students with 100 or more books at home (%)	**73.0**	***1.2***	**78.0**	***1.2***	75.0	*0.8*
Parental academic interest	-0.08	*0.02*	-0.07	*0.03*	-0.07	*0.02*
Parental social interest	-0.32	*0.03*	-0.29	*0.03*	-0.31	*0.02*
Home cultural possessions	**-0.47**	***0.03***	**-0.24**	***0.03***	-0.35	*0.02*
Home educational resources	**-0.22**	***0.03***	**-0.07**	***0.03***	-0.14	*0.02*
Computer at home (%)	**71.3**	***1.3***	**82.6**	***1.1***	77.3	*0.8*
Internet access at home (%)	**53.9**	***1.4***	**68.8**	***1.2***	61.7	*0.9*
Student's school experience						
Disciplinary climate	0.18	*0.02*	0.19	*0.03*	0.18	*0.02*
Teacher-student relations	0.22	*0.03*	0.14	*0.03*	0.18	*0.02*
Teacher support	0.25	*0.03*	0.17	*0.03*	0.21	*0.02*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools

Table A4b

New Brunswick

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	89.23	*(1.00)*	92.52	*(0.95)*	90.36	*(0.76)*
Number of 15-year-olds	**143.63**	***(10.81)***	**286.27**	***(22.58)***	192.60	*(13.34)*
K to 12 schools (%)	9.24	*(4.42)*	1.72	*(2.77)*	6.66	*(3.07)*
Negative teacher behaviours	0.30	*(0.14)*	0.18	*(0.13)*	0.26	*(0.10)*
Negative student behaviours	0.52	*(0.08)*	0.82	*(0.11)*	0.62	*(0.07)*
Teacher morale	-0.10	*(0.18)*	-0.05	*(0.19)*	-0.09	*(0.13)*
Student-teacher ratio	**16.99**	***(0.26)***	**18.30**	***(0.28)***	17.46	*(0.21)*
Inadequacy of instructional resources	0.14	*(0.10)*	-0.06	*(0.23)*	0.07	*(0.10)*
Shortage of teachers	0.52	*(0.14)*	0.63	*(0.19)*	0.56	*(0.11)*
Professional development (%)	59.53	*(5.63)*	76.05	*(6.45)*	65.36	*(4.38)*
Inadequacy of material resources	-0.20	*(0.13)*	-0.29	*(0.20)*	-0.23	*(0.11)*
Computer availability	5.97	*(0.39)*	6.83	*(0.66)*	6.27	*(0.35)*
Teacher specialization (%)	65.15	*(4.09)*	74.16	*(5.44)*	68.25	*(3.29)*
School autonomy	-0.77	*(0.12)*	-0.58	*(0.13)*	-0.71	*(0.09)*
Teacher participation to decision making	-0.18	*(0.13)*	-0.59	*(0.14)*	-0.32	*(0.10)*
Community characteristics						
Population density	222.23	*(26.00)*	263.10	*(29.36)*	236.26	*(19.84)*
Adult unemployment rate	**14.61**	***(1.21)***	**8.89**	***(0.69)***	12.65	*(0.89)*
Adult employment rate	**50.84**	***(1.21)***	**57.11**	***(1.20)***	52.99	*(0.97)*
White collar employment	**39.02**	***(1.30)***	**48.49**	***(2.13)***	42.27	*(1.24)*
Post-secondary enrollment	58.50	*(1.50)*	62.63	*(2.15)*	59.92	*(1.24)*
Post-secondary education	**43.85**	***(1.22)***	**53.27**	***(2.25)***	47.09	*(1.23)*
University education	**19.18**	***(1.02)***	**28.34**	***(2.56)***	22.32	*(1.22)*
Average income ($)	20,129	*(423)*	24,780	*(1,785)*	21,726	*(718)*
Average family income ($)	43,647	*(976)*	52,880	*(3,211)*	46,817	*(1,371)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A5a

Quebec

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	527	*4.6*	538	*3.6*	536	*3.0*
Mathematics achievement	543	*5.6*	552	*3.3*	550	*2.7*
Science achievement	533	*5.3*	543	*4.1*	541	*3.4*
Student cultural activities	**-0.15**	***0.04***	**0.00**	***0.03***	-0.03	*0.02*
Reading enjoyment	-0.12	*0.07*	-0.06	*0.02*	-0.07	*0.02*
Homework - students doing 4 or more hours per week (%)	28.0	*3.6*	30.0	*1.3*	30.0	*1.1*
Career expectations	**54.8**	***0.9***	**60.4**	***0.5***	59.3	*0.4*
Percentage of students who expect to get postsecondary education (%)	**91.0**	***1.0***	**95.0**	***0.6***	94.0	*0.5*
Percentage of students who expect to get university rather than college (%)	**50.0**	***2.4***	**64.0**	***1.4***	61.0	*1.3*
Percentage of student with 30 minutes or more transportation time (%)	24.0	*2.7*	20.0	*1.3*	21.0	*1.2*
Students participating in school extracurricular activities (%)	50.0	*2.9*	47.0	*1.2*	48.0	*0.9*
Students participating in non-school extracurricular activities (%)	**49.0**	***1.6***	**55.0**	***1.1***	54.0	*0.9*
Using computer at school at least several times per month (%)	45.0	*2.9*	37.0	*1.5*	39.0	*1.3*
Using internet at school at least several times per month (%)	41.0	*3.2*	34.0	*1.4*	35.0	*1.2*
Family characteristics						
Family socio-economic status	**47.5**	***0.8***	**52.5**	***0.4***	51.5	*0.4*
Highest parent educational attainment	**5.2**	***0.1***	**5.4**	***0.0***	5.4	*0.0*
Students with 100 or more books at home (%)	**59.0**	***1.8***	**65.0**	***1.0***	64.0	*0.9*
Parental academic interest	**0.00**	***0.05***	**0.14**	***0.02***	0.12	*0.02*
Parental social interest	-0.23	*0.05*	-0.22	*0.02*	-0.22	*0.02*
Home cultural possessions	**-0.61**	***0.03***	**-0.35**	***0.03***	-0.40	*0.02*
Home educational resources	**-0.18**	***0.04***	**-0.02**	***0.02***	-0.05	*0.02*
Computer at home (%)	**71.6**	***2.4***	**81.6**	***1.0***	79.6	*0.9*
Internet access at home (%)	**48.5**	***2.7***	**61.9**	***1.0***	59.3	*1.0*
Student's school experience						
Disciplinary climate	-0.03	*0.06*	0.10	*0.03*	0.08	*0.03*
Teacher-student relations	0.27	*0.07*	0.28	*0.03*	0.28	*0.02*
Teacher support	0.33	*0.06*	0.33	*0.02*	0.33	*0.02*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A5b

Quebec

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	90.77	*(1.62)*	88.43	*(0.91)*	88.87	*(0.80)*
Number of 15-year-olds	659.80	*(31.29)*	637.60	*(18.11)*	641.77	*(15.81)*
K to 12 schools (%)	0.00	*(0.00)*	0.00	*(0.00)*	0.00	*(0.00)*
Negative teacher behaviours	0.22	*(0.17)*	0.28	*(0.07)*	0.27	*(0.07)*
Negative student behaviours	0.40	*(0.16)*	0.14	*(0.08)*	0.19	*(0.08)*
Teacher morale	0.09	*(0.13)*	-0.08	*(0.08)*	-0.05	*(0.07)*
Student-teacher ratio	17.15	*(0.74)*	17.32	*(0.29)*	17.28	*(0.28)*
Inadequacy of instructional resources	-0.52	*(0.16)*	-0.67	*(0.08)*	-0.65	*(0.07)*
Shortage of teachers	0.04	*(0.18)*	-0.16	*(0.08)*	-0.12	*(0.08)*
Professional development (%)	41.98	*(6.61)*	43.50	*(3.16)*	43.21	*(2.84)*
Inadequacy of material resources	**-0.67**	***(0.10)***	**-0.59**	***(0.06)***	-0.61	*(0.05)*
Computer availability	8.16	*(0.39)*	10.60	*(0.78)*	10.11	*(0.63)*
Teacher specialization (%)	81.17	*(3.72)*	86.27	*(1.83)*	85.22	*(1.64)*
School autonomy	-0.24	*(0.15)*	-0.21	*(0.06)*	-0.22	*(0.06)*
Teacher participation to decision making	**0.21**	***(0.15)***	**-0.01**	***(0.09)***	0.03	*(0.07)*
Community characteristics						
Population density	231.75	*(63.38)*	1,939.63	*(168.27)*	1,618.76	*(1,46.63)*
Adult unemployment rate	10.28	*(1.03)*	10.22	*(0.27)*	10.23	*(0.29)*
Adult employment rate	**53.90**	***(1.10)***	**54.82**	***(0.54)***	54.64	*(0.49)*
White collar employment	36.73	*(1.20)*	48.86	*(0.65)*	46.58	*(0.68)*
Post-secondary enrollment	**65.00**	***(2.25)***	**70.32**	***(0.61)***	69.32	*(0.67)*
Post-secondary education	**38.30**	***(1.25)***	**49.40**	***(0.81)***	47.31	*(0.78)*
University education	**11.98**	***(0.69)***	**22.22**	***(0.90)***	20.30	*(0.80)*
Average income ($)	**21,573**	***(485)***	**23,705**	***(464)***	23,304	*(393)*
Average family income ($)	46,020	*(1,004)*	50,672	*(1,190)*	49,798	*(994)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A6a

Ontario

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	520	*4.7*	535	*3.7*	533	*3.3*
Mathematics achievement	519	*3.7*	525	*3.4*	524	*2.9*
Science achievement	518	*6.5*	523	*3.9*	522	*3.4*
Student cultural activities	0.11	*0.03*	0.21	*0.03*	0.20	*0.03*
Reading enjoyment	0.00	*0.06*	0.05	*0.03*	0.04	*0.02*
Homework - students doing 4 or more hours per week (%)	**30.0**	***2.5***	**42.0**	***1.4***	41.0	*1.3*
Career expectations	**57.8**	***0.8***	**63.9**	***0.4***	63.1	*0.4*
Percentage of students who expect to get postsecondary education (%)	91.0	*1.6*	95.0	*0.5*	94.0	*0.5*
Percentage of students who expect to get university rather than college (%)	**68.0**	***2.8***	**80.0**	***1.3***	78.0	*1.3*
Percentage of student with 30 minutes or more transportation time (%)	**27.0**	***2.7***	**15.0**	***0.9***	16.0	*0.9*
Students participating in school extracurricular activities (%)	62.0	*2.6*	60.0	*1.4*	61.0	*1.2*
Students participating in non-school extracurricular activities (%)	65.0	*2.3*	65.0	*1.2*	65.0	*1.1*
Using computer at school at least several times per month (%)	58.0	*2.9*	53.0	*1.6*	54.0	*1.3*
Using internet at school at least several times per month (%)	50.0	*3.9*	46.0	*1.7*	47.0	*1.5*
Family characteristics						
Family socio-economic status	**48.5**	***1.1***	**55.1**	***0.5***	54.2	*0.5*
Highest parent educational attainment	5.5	*0.1*	5.6	*0.0*	5.6	*0.0*
Students with 100 or more books at home (%)	83.0	*2.0*	79.0	*1.0*	79.0	*0.9*
Parental academic interest	-0.02	*0.04*	0.10	*0.02*	0.09	*0.02*
Parental social interest	-0.20	*0.04*	-0.19	*0.02*	-0.19	*0.02*
Home cultural possessions	-0.08	*0.05*	0.04	*0.03*	0.02	*0.03*
Home educational resources	**-0.14**	***0.04***	**0.08**	***0.03***	0.05	*0.02*
Computer at home (%)	90.0	*1.6*	93.5	*0.6*	93.0	*0.6*
Internet access at home (%)	73.3	*2.3*	78.0	*1.0*	77.3	*0.9*
Student's school experience						
Disciplinary climate	0.19	*0.06*	0.15	*0.03*	0.16	*0.02*
Teacher-student relations	0.23	*0.05*	0.24	*0.03*	0.24	*0.03*
Teacher support	0.31	*0.05*	0.31	*0.03*	0.31	*0.03*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A6b
Ontario
Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	94.20	*(0.99)*	91.61	*(1.14)*	92.08	*(0.95)*
Number of 15-year-olds	849.03	*(44.83)*	928.91	*(20.67)*	914.42	*(18.86)*
K to 12 schools (%)	0.00	*(0.00)*	0.92	*(0.80)*	0.75	*(0.65)*
Negative teacher behaviours	-0.34	*(0.15)*	-0.38	*(0.07)*	-0.37	*(0.07)*
Negative student behaviours	0.47	*(0.12)*	0.27	*(0.07)*	0.31	*(0.06)*
Teacher morale	-0.06	*(0.15)*	-0.01	*(0.08)*	-0.01	*(0.07)*
Student-teacher ratio	15.39	*(0.45)*	16.19	*(0.24)*	16.04	*(0.21)*
Inadequacy of instructional resources	0.07	*(0.16)*	-0.20	*(0.09)*	-0.15	*(0.08)*
Shortage of teachers	0.16	*(0.19)*	-0.13	*(0.08)*	-0.07	*(0.08)*
Professional development (%)	48.66	*(6.34)*	50.04	*(3.08)*	49.78	*(2.76)*
Inadequacy of material resources	-0.51	*(0.11)*	-0.36	*(0.08)*	-0.39	*(0.07)*
Computer availability	**3.94**	***(0.16)***	**5.96**	***(0.26)***	5.56	*(0.22)*
Teacher specialization (%)	76.09	*(3.24)*	85.47	*(1.35)*	83.66	*(1.28)*
School autonomy	0.55	*(0.16)*	0.55	*(0.08)*	0.55	*(0.07)*
Teacher participation to decision making	0.11	*(0.16)*	-0.04	*(0.08)*	-0.01	*(0.07)*
Community characteristics						
Population density	**579.67**	***(68.31)***	**1,590.90**	***(1,20.57)***	1,407.54	*(103.54)*
Adult unemployment rate	7.19	*(0.51)*	7.32	*(0.16)*	7.30	*(0.16)*
Adult employment rate	**54.89**	***(1.24)***	**61.43**	***(0.50)***	60.25	*(0.50)*
White collar employment	**37.48**	***(0.95)***	**48.43**	***(0.61)***	46.44	*(0.62)*
Post-secondary enrollment	**60.33**	***(1.51)***	**69.25**	***(0.40)***	67.63	*(0.50)*
Post-secondary education	**41.71**	***(0.58)***	**54.02**	***(0.55)***	51.79	*(0.58)*
University education	**12.76**	***(0.42)***	**25.75**	***(0.70)***	23.39	*(0.68)*
Average income ($)	**22,519**	***(496)***	**28,401**	***(318)***	27,335	*(323)*
Average family income ($)	**49,204**	***(1,189)***	**62,487**	***(822)***	60,078	*(801)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A7a

Manitoba

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	527	*4.6*	531	*4.7*	529	*3.5*
Mathematics achievement	536	*5.3*	532	*4.9*	533	*3.7*
Science achievement	526	*4.5*	527	*4.6*	527	*3.6*
Student cultural activities	**-0.04**	***0.04***	**0.18**	***0.04***	0.11	*0.03*
Reading enjoyment	-0.07	*0.04*	-0.05	*0.04*	-0.06	*0.03*
Homework - students doing 4 or more hours per week (%)	21.0	*2.0*	27.0	*1.7*	25.0	*1.3*
Career expectations	**56.1**	***0.8***	**61.1**	***0.7***	59.4	*0.5*
Percentage of students who expect to get postsecondary education (%)	**85.0**	***1.5***	**91.0**	***1.0***	89.0	*0.9*
Percentage of students who expect to get university rather than college (%)	**74.0**	***1.5***	**65.0**	***1.2***	81.0	*1.1*
Percentage of student with 30 minutes or more transportation time (%)	**26.0**	***2.0***	**8.0**	***0.8***	14.0	*0.9*
Students participating in school extracurricular activities (%)	**67.0**	***2.0***	**61.0**	***1.5***	63.0	*1.4*
Students participating in non-school extracurricular activities (%)	67.0	*2.2*	65.0	*1.7*	66.0	*1.4*
Using computer at school at least several times per month (%)	**74.0**	***2.3***	**57.0**	***1.6***	63.0	*1.4*
Using internet at school at least several times per month (%)	**60.0**	***3.1***	**50.0**	***1.6***	53.0	*1.8*
Family characteristics						
Family socio-economic status	**46.9**	***0.7***	**52.3**	***0.7***	50.4	*0.5*
Highest parent educational attainment	**5.2**	***0.1***	**5.4**	***0.0***	5.4	*0.0*
Students with 100 or more books at home (%)	76.0	*1.7*	77.0	*1.5*	77.0	*1.1*
Parental academic interest	**-0.16**	***0.04***	**0.00**	***0.04***	-0.06	*0.03*
Parental social interest	-0.34	*0.04*	-0.32	*0.03*	-0.33	*0.03*
Home cultural possessions	**-0.35**	***0.03***	**-0.14**	***0.04***	-0.21	*0.03*
Home educational resources	**-0.30**	***0.04***	**-0.09**	***0.04***	-0.16	*0.03*
Computer at home (%)	**80.9**	***1.9***	**87.1**	***1.2***	85.0	*1.0*
Internet access at home (%)	**50.6**	***1.9***	**68.7**	***1.6***	62.5	*1.4*
Student's school experience						
Disciplinary climate	0.26	*0.06*	0.21	*0.04*	0.23	*0.03*
Teacher-student relations	**0.12**	***0.05***	**0.33**	***0.03***	0.26	*0.03*
Teacher support	0.30	*0.05*	0.39	*0.03*	0.36	*0.03*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A7b

Manitoba

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	94.51	*(0.78)*	95.19	*(0.68)*	94.87	*(0.51)*
Number of 15-year-olds	**124.45**	***(8.92)***	**194.49**	***(12.04)***	161.46	*(8.32)*
K to 12 schools (%)	**30.68**	***(6.66)***	**4.07**	***(2.69)***	16.63	*(3.67)*
Negative teacher behaviours	0.00	*(0.11)*	0.03	*(0.10)*	0.02	*(0.08)*
Negative student behaviours	0.27	*(0.10)*	0.21	*(0.12)*	0.24	*(0.08)*
Teacher morale	0.24	*(0.14)*	0.09	*(0.11)*	0.16	*(0.09)*
Student-teacher ratio	16.06	*(0.54)*	16.78	*(0.34)*	16.47	*(0.30)*
Inadequacy of instructional resources	0.19	*(0.12)*	0.10	*(0.10)*	0.14	*(0.08)*
Shortage of teachers	0.21	*(0.14)*	0.30	*(0.14)*	0.26	*(0.10)*
Professional development (%)	83.29	*(4.09)*	87.32	*(3.42)*	85.43	*(2.63)*
Inadequacy of material resources	-0.31	*(0.11)*	-0.13	*(0.12)*	-0.21	*(0.08)*
Computer availability	4.28	*(0.23)*	4.60	*(0.22)*	4.47	*(0.16)*
Teacher specialization (%)	**61.38**	***(3.28)***	**79.99**	***(3.14)***	70.80	*(2.46)*
School autonomy	0.66	*(0.11)*	0.52	*(0.13)*	0.59	*(0.09)*
Teacher participation to decision making	0.37	*(0.16)*	0.38	*(0.13)*	0.37	*(0.10)*
Community characteristics						
Population density	**385.89**	***(40.25)***	**1,189.55**	***(47.74)***	810.47	*(50.20)*
Adult unemployment rate	**4.40**	***(0.54)***	**6.65**	***(0.09)***	5.59	*(0.28)*
Adult employment rate	**56.78**	***(1.23)***	**61.89**	***(0.40)***	59.48	*(0.67)*
White collar employment	**35.39**	***(1.12)***	**46.37**	***(0.33)***	41.19	*(0.77)*
Post-secondary enrollment	**51.26**	***(1.88)***	**59.97**	***(0.39)***	55.86	*(1.00)*
Post-secondary education	**37.84**	***(1.12)***	**52.60**	***(0.30)***	45.63	*(0.90)*
University education	**15.21**	***(0.64)***	**27.42**	***(0.44)***	21.66	*(0.70)*
Average income ($)	**20,250**	***(494)***	**24,017**	***(168)***	22,240	*(308)*
Average family income ($)	**44,716**	***(1,023)***	**52,991**	***(337)***	49,088	*(651)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A8a

Saskatchewan

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	523	*4.6*	533	*3.2*	529	*2.7*
Mathematics achievement	525	*4.3*	524	*3.5*	525	*2.9*
Science achievement	520	*4.4*	523	*4.2*	522	*3.0*
Student cultural activities	**-0.07**	***0.04***	**0.14**	***0.03***	0.05	*0.02*
Reading enjoyment	-0.12	*0.04*	-0.16	*0.03*	-0.14	*0.03*
Homework - students doing 4 or more hours per week (%)	**15.0**	***1.6***	**22.0**	***1.3***	19.0	*1.1*
Career expectations	**55.8**	***0.6***	**61.2**	***0.6***	58.9	*0.5*
Percentage of students who expect to get postsecondary education (%)	87.0	*1.0*	89.0	*1.0*	88.0	*0.7*
Percentage of students who expect to get university rather than college (%)	**76.0**	***1.7***	**85.0**	***1.6***	81.0	*1.1*
Percentage of student with 30 minutes or more transportation time (%)	**23.0**	***1.6***	**11.0**	***1.0***	16.0	*1.0*
Students participating in school extracurricular activities (%)	**74.0**	***1.7***	**63.0**	***1.9***	68.0	*1.4*
Students participating in non-school extracurricular activities (%)	71.0	*1.6*	72.0	*1.3*	72.0	*1.0*
Using computer at school at least several times per month (%)	**77.0**	***2.8***	**49.0**	***2.2***	61.0	*1.6*
Using internet at school at least several times per month (%)	**67.0**	***3.6***	**43.0**	***2.2***	53.0	*1.9*
Family characteristics						
Family socio-economic status	**47.3**	***0.5***	**53.7**	***0.5***	51.0	*0.3*
Highest parent educational attainment	**5.4**	***0.0***	**5.5**	***0.0***	5.5	*0.0*
Students with 100 or more books at home (%)	77.0	*1.8*	78.0	*1.2*	78.0	*1.0*
Parental academic interest	-0.18	*0.04*	-0.07	*0.03*	-0.12	*0.02*
Parental social interest	-0.38	*0.03*	-0.31	*0.03*	-0.34	*0.02*
Home cultural possessions	**-0.29**	***0.04***	**-0.13**	***0.03***	-0.20	*0.02*
Home educational resources	**-0.27**	***0.04***	**-0.14**	***0.03***	-0.19	*0.02*
Computer at home (%)	84.2	*1.4*	89.3	*0.9*	87.1	*0.8*
Internet access at home (%)	55.6	*1.7*	69.6	*1.5*	63.7	*1.1*
Student's school experience						
Disciplinary climate	0.15	*0.05*	0.12	*0.03*	0.13	*0.03*
Teacher-student relations	0.24	*0.04*	0.30	*0.04*	0.28	*0.03*
Teacher support	0.38	*0.05*	0.41	*0.03*	0.40	*0.03*

Note *(s.e.)* is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A8b

Saskatchewan

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	93.71	*(0.81)*	94.84	*(0.73)*	94.16	*(0.57)*
Number of 15-year-olds	**96.50**	***(4.32)***	**197.22**	***(10.56)***	136.96	*(6.74)*
K to 12 schools (%)	**44.25**	***(6.04)***	**3.46**	***(2.69)***	27.66	*(4.18)*
Negative teacher behaviours	-0.17	*(0.11)*	-0.19	*(0.15)*	-0.18	*(0.09)*
Negative student behaviours	0.23	*(0.09)*	0.26	*(0.12)*	0.24	*(0.07)*
Teacher morale	**0.05**	***(0.11)***	**0.77**	***(0.14)***	0.34	*(0.09)*
Student-teacher ratio	**16.09**	***(0.30)***	**18.59**	***(0.32)***	17.12	*(0.25)*
Inadequacy of instructional resources	**0.12**	***(0.10)***	**-0.37**	***(0.14)***	-0.08	*(0.09)*
Shortage of teachers	0.24	*(0.11)*	0.28	*(0.13)*	0.26	*(0.08)*
Professional development (%)	65.00	*(4.11)*	76.62	*(5.08)*	69.67	*(3.22)*
Inadequacy of material resources	-0.29	*(0.10)*	-0.31	*(0.10)*	-0.30	*(0.07)*
Computer availability	5.43	*(0.22)*	7.87	*(1.15)*	6.42	*(0.50)*
Teacher specialization (%)	**52.98**	***(2.78)***	**75.46**	***(3.31)***	61.84	*(2.36)*
School autonomy	-0.04	*(0.07)*	-0.07	*(0.09)*	-0.05	*(0.06)*
Teacher participation to decision making	0.34	*(0.12)*	0.39	*(0.14)*	0.36	*(0.09)*
Community characteristics						
Population density	**379.86**	***(26.03)***	**1,088.23**	***(75.51)***	664.42	*(46.79)*
Adult unemployment rate	5.26	*(0.75)*	5.93	*(0.22)*	5.53	*(0.46)*
Adult employment rate	**55.78**	***(1.24)***	**62.78**	***(0.72)***	58.59	*(0.85)*
White collar employment	**32.70**	***(1.14)***	**44.24**	***(0.94)***	37.34	*(0.94)*
Post-secondary enrollment	55.58	*(2.23)*	59.11	*(0.89)*	57.00	*(1.39)*
Post-secondary education	**33.55**	***(1.12)***	**51.72**	***(0.95)***	43.84	*(0.98)*
University education	**15.26**	***(0.73)***	**25.73**	***(1.08)***	19.46	*(0.78)*
Average income ($)	**19,359**	***(778)***	**24,616**	***(457)***	21,471	*(553)*
Average family income ($)	**41,897**	***(1,711)***	**53,860**	***(1,269)***	46,702	*(1,263)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A9a

Alberta

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	**536**	***4.3***	**557**	***4.2***	550	*3.3*
Mathematics achievement	541	*5.0*	550	*4.3*	547	*3.3*
Science achievement	**532**	***4.6***	**553**	***4.3***	546	*3.5*
Student cultural activities	0.10	*0.04*	0.22	*0.03*	0.18	*0.02*
Reading enjoyment	**-0.14**	***0.05***	**0.04**	***0.03***	-0.02	*0.03*
Homework - students doing 4 or more hours per week (%)	**26.0**	***2.0***	**37.0**	***1.7***	33.0	*1.3*
Career expectations	**56.6**	***1.0***	**63.4**	***0.5***	61.3	*0.4*
Percentage of students who expect to get postsecondary education (%)	89.0	*1.1*	92.0	*0.6*	91.0	*0.5*
Percentage of students who expect to get university rather than college (%)	**63.0**	***2.5***	**81.0**	***1.3***	76.0	*1.2*
Percentage of student with 30 minutes or more transportation time (%)	28.0	*2.4*	23.0	*1.7*	24.0	*1.4*
Students participating in school extracurricular activities (%)	61.0	*2.1*	58.0	*1.4*	59.0	*1.1*
Students participating in non-school extracurricular activities (%)	70.0	*2.2*	67.0	*1.4*	68.0	*1.2*
Using computer at school at least several times per month (%)	**72.0**	***2.7***	**54.0**	***1.5***	60.0	*1.3*
Using internet at school at least several times per month (%)	**67.0**	***3.0***	**50.0**	***1.6***	56.0	*1.4*
Family characteristics						
Family socio-economic status	**50.5**	***0.9***	**55.6**	***0.6***	54.1	*0.5*
Highest parent educational attainment	5.4	*0.0*	5.5	*0.0*	5.5	*0.0*
Students with 100 or more books at home (%)	77.0	*1.7*	81.0	*1.3*	79.0	*1.0*
Parental academic interest	**-0.06**	***0.04***	**0.15**	***0.03***	0.09	*0.02*
Parental social interest	-0.21	*0.04*	-0.11	*0.02*	-0.14	*0.02*
Home cultural possessions	**-0.21**	***0.06***	**0.08**	***0.03***	-0.01	*0.03*
Home educational resources	**-0.07**	***0.05***	**0.15**	***0.03***	0.09	*0.03*
Computer at home (%)	**87.2**	***1.2***	**91.3**	***0.8***	90.0	*0.7*
Internet access at home (%)	**61.3**	***1.7***	**79.0**	***1.3***	73.5	*1.1*
Student's school experience						
Disciplinary climate	0.23	*0.05*	0.12	*0.03*	0.15	*0.02*
Teacher-student relations	0.19	*0.04*	0.31	*0.03*	0.27	*0.02*
Teacher support	0.19	*0.05*	0.28	*0.03*	0.25	*0.02*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A9b

Alberta

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	92.17	*(1.36)*	95.83	*(0.69)*	94.67	*(0.65)*
Number of 15-year-olds	352.53	*(16.22)*	380.63	*(13.85)*	371.73	*(10.79)*
K to 12 schools (%)	**27.69**	***(7.50)***	**2.12**	***(1.63)***	10.19	*(2.82)*
Negative teacher behaviours	-0.06	*(0.12)*	-0.19	*(0.10)*	-0.14	*(0.08)*
Negative student behaviours	0.28	*(0.12)*	0.28	*(0.08)*	0.28	*(0.07)*
Teacher morale	0.20	*(0.14)*	0.48	*(0.11)*	0.39	*(0.09)*
Student-teacher ratio	18.72	*(0.55)*	19.60	*(0.36)*	19.32	*(0.30)*
Inadequacy of instructional resources	-0.08	*(0.14)*	-0.19	*(0.12)*	-0.16	*(0.09)*
Shortage of teachers	0.40	*(0.16)*	0.31	*(0.13)*	0.34	*(0.10)*
Professional development (%)	74.09	*(5.06)*	72.28	*(4.23)*	72.87	*(3.29)*
Inadequacy of material resources	-0.12	*(0.13)*	0.05	*(0.10)*	-0.01	*(0.08)*
Computer availability	4.93	*(0.23)*	5.40	*(0.25)*	5.25	*(0.18)*
Teacher specialization (%)	**58.59**	***(4.04)***	**79.34**	***(2.43)***	72.24	*(2.31)*
School autonomy	0.36	*(0.11)*	0.26	*(0.08)*	0.29	*(0.07)*
Teacher participation to decision making	0.72	*(0.15)*	0.39	*(0.13)*	0.50	*(0.10)*
Community characteristics						
Population density	**415.20**	***(40.56)***	**809.43**	***(38.89)***	684.59	*(33.88)*
Adult unemployment rate	6.30	*(0.55)*	6.19	*(0.13)*	6.23	*(0.19)*
Adult employment rate	63.93	*(1.65)*	67.19	*(0.45)*	66.16	*(0.62)*
White collar employment	**37.55**	***(0.98)***	**46.63**	***(0.51)***	43.75	*(0.61)*
Post-secondary enrollment	**52.62**	***(1.62)***	**60.95**	***(0.52)***	58.31	*(0.72)*
Post-secondary education	**46.46**	***(1.19)***	**57.87**	***(0.47)***	54.25	*(0.69)*
University education	**15.39**	***(0.62)***	**26.01**	***(0.65)***	22.65	*(0.66)*
Average income ($)	**24,189**	***(650)***	**27,383**	***(371)***	26,372	*(353)*
Average family income ($)	**51,631**	***(1,372)***	**59,471**	***(834)***	56,989	*(788)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A10a
British Columbia
Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	530	*9.4*	539	*2.9*	538	*2.9*
Mathematics achievement	526	*7.1*	536	*3.0*	534	*2.8*
Science achievement	523	*12.1*	535	*3.1*	533	*3.2*
Student cultural activities	**0.06**	***0.06***	**0.24**	***0.03***	0.21	*0.03*
Reading enjoyment	0.02	*0.07*	0.03	*0.03*	0.03	*0.02*
Homework - students doing 4 or more hours per week (%)	**33.0**	***2.6***	**42.0**	***1.6***	41.0	*1.4*
Career expectations	59.5	*1.4*	63.4	*0.4*	62.8	*0.4*
Percentage of students who expect to get postsecondary education (%)	90.0	*1.5*	92.0	*0.6*	92.0	*0.5*
Percentage of students who expect to get university rather than college (%)	**72.0**	***2.4***	**82.0**	***1.1***	81.0	*0.9*
Percentage of student with 30 minutes or more transportation time (%)	**19.0**	***3.5***	**8.0**	***0.9***	10.0	*1.0*
Students participating in school extracurricular activities (%)	62.0	*4.4*	62.0	*1.1*	62.0	*1.2*
Students participating in non-school extracurricular activities (%)	66.0	*2.9*	69.0	*1.0*	69.0	*0.9*
Using computer at school at least several times per month (%)	**55.0**	***3.4***	**44.0**	***1.7***	46.0	*1.6*
Using internet at school at least several times per month (%)	48.0	*4.4*	40.0	*2.0*	41.0	*1.8*
Family characteristics						
Family socio-economic status	**49.7**	***0.7***	**54.0**	***0.6***	53.3	*0.5*
Highest parent educational attainment	5.5	*0.0*	5.5	*0.0*	5.5	*0.0*
Students with 100 or more books at home (%)	85.0	*2.1*	79.0	*1.0*	79.0	*1.0*
Parental academic interest	0.00	*0.06*	0.16	*0.03*	0.14	*0.02*
Parental social interest	-0.21	*0.04*	-0.20	*0.02*	-0.20	*0.02*
Home cultural possessions	-0.08	*0.11*	0.03	*0.03*	0.01	*0.03*
Home educational resources	-0.09	*0.06*	0.07	*0.03*	0.04	*0.02*
Computer at home (%)	88.6	*2.1*	93.7	*0.8*	92.9	*0.7*
Internet access at home (%)	**65.8**	***3.4***	**78.0**	***1.3***	76.1	*1.2*
Student's school experience						
Disciplinary climate	0.09	*0.07*	0.12	*0.03*	0.11	*0.03*
Teacher-student relations	0.20	*0.05*	0.16	*0.03*	0.17	*0.03*
Teacher support	0.33	*0.06*	0.21	*0.03*	0.23	*0.03*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

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Table A10b

British Columbia

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Provincial Average	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	94.52	*(1.10)*	95.42	*(0.44)*	95.28	*(0.41)*
Number of 15-year-olds	425.33	*(21.66)*	396.63	*(8.31)*	401.07	*(7.80)*
K to 12 schools (%)	0.56	*(1.81)*	4.10	*(1.95)*	3.57	*(1.69)*
Negative teacher behaviours	-0.33	*(0.20)*	-0.13	*(0.09)*	-0.16	*(0.08)*
Negative student behaviours	0.11	*(0.21)*	0.20	*(0.07)*	0.19	*(0.07)*
Teacher morale	0.76	*(0.24)*	0.15	*(0.10)*	0.24	*(0.10)*
Student-teacher ratio	17.46	*(1.01)*	17.38	*(0.30)*	17.39	*(0.30)*
Inadequacy of instructional resources	-0.28	*(0.22)*	-0.24	*(0.10)*	-0.25	*(0.09)*
Shortage of teachers	-0.18	*(0.20)*	-0.30	*(0.08)*	-0.28	*(0.07)*
Professional development (%)	**99.24**	***(1.70)***	**80.16**	***(3.33)***	82.76	*(2.95)*
Inadequacy of material resources	-0.32	*(0.23)*	-0.34	*(0.08)*	-0.33	*(0.08)*
Computer availability	5.73	*(0.58)*	6.20	*(0.29)*	6.12	*(0.26)*
Teacher specialization (%)	73.67	*(4.99)*	83.13	*(1.82)*	81.73	*(1.74)*
School autonomy	0.35	*(0.22)*	0.36	*(0.09)*	0.36	*(0.08)*
Teacher participation to decision making	0.07	*(0.29)*	0.22	*(0.10)*	0.20	*(0.10)*
Community characteristics						
Population density	**412.30**	***(90.03)***	**1,128.72**	***(132.13)***	1,018.05	*(114.88)*
Adult unemployment rate	8.84	*(0.59)*	8.08	*(0.23)*	8.19	*(0.22)*
Adult employment rate	56.77	*(2.03)*	61.23	*(0.44)*	60.54	*(0.51)*
White collar employment	**37.48**	***(1.47)***	**45.19**	***(0.72)***	44.00	*(0.69)*
Post-secondary enrollment	**56.08**	***(1.50)***	**61.99**	***(0.70)***	61.08	*(0.66)*
Post-secondary education	**50.12**	***(1.63)***	**56.17**	***(0.66)***	55.23	*(0.64)*
University education	**17.82**	***(1.33)***	**25.77**	***(0.84)***	24.54	*(0.78)*
Average income ($)	24,808	*(874)*	27,136	*(422)*	26,777	*(388)*
Average family income ($)	**51,627**	***(1,890)***	**58,810**	***(1,103)***	57,700	*(1,002)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A11a

Canada

Characteristics of students in rural and urban schools

	Rural schools		Urban schools		Canada	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
Individual characteristics						
Reading achievement	**523**	***1.9***	**538**	***2.0***	534	*1.6*
Mathematics achievement	527	*2.1*	535	*1.8*	533	*1.4*
Science achievement	**521**	***2.2***	**532**	***2.0***	529	*1.6*
Student cultural activities	**-0.01**	***0.02***	**0.16**	***0.02***	0.12	*0.01*
Reading enjoyment	**-0.06**	***0.02***	**0.01**	***0.01***	0.00	*0.01*
Homework - students doing 4 or more hours per week (%)	28.0	*1.1*	37.0	*0.7*	35.0	*0.6*
Career expectations	**57.2**	***0.4***	**62.8**	***0.2***	61.6	*0.2*
Percentage of students who expect to get postsecondary education (%)	**90.0**	***0.6***	**94.0**	***0.3***	93.0	*0.2*
Percentage of students who expect to get university rather than college (%)	**66.0**	***1.0***	**77.0**	***0.7***	75.0	*0.6*
Percentage of student with 30 minutes or more transportation time (%)	**24.0**	***0.9***	**16.0**	***0.5***	17.0	*0.5*
Students participating in school extracurricular activities (%)	60.0	*1.0*	57.0	*0.7*	58.0	*0.6*
Students participating in non-school extracurricular activities (%)	62.0	*0.9*	64.0	*0.5*	63.0	*0.4*
Using computer at school at least several times per month (%)	**59.0**	***1.2***	**48.0**	***0.9***	50.0	*0.7*
Using internet at school at least several times per month (%)	**52.0**	***1.5***	**43.0**	***1.0***	45.0	*0.8*
Family characteristics						
Family socio-economic status	**48.1**	***0.4***	**54.1**	***0.3***	52.8	*0.2*
Highest parent educational attainment	**5.3**	***0.0***	**5.5**	***0.0***	5.5	*0.0*
Students with 100 or more books at home (%)	75.0	*0.9*	76.0	*0.6*	76.0	*0.5*
Parental academic interest	**-0.05**	***0.02***	**0.11**	***0.01***	0.08	*0.01*
Parental social interest	-0.24	*0.02*	-0.20	*0.01*	-0.21	*0.01*
Home cultural possessions	**-0.28**	***0.02***	**-0.07**	***0.02***	-0.12	*0.01*
Home educational resources	**-0.14**	***0.02***	**0.04**	***0.01***	0.00	*0.01*
Computer at home (%)	**81.8**	***0.9***	**89.6**	***0.4***	87.9	*0.3*
Internet access at home (%)	**59.7**	***1.2***	**73.1**	***0.6***	70.2	*0.5*
Student's school experience						
Disciplinary climate	0.14	*0.02*	0.14	*0.02*	0.14	*0.01*
Teacher-student relations	0.24	*0.02*	0.25	*0.01*	0.25	*0.01*
Teacher support	0.31	*0.02*	0.31	*0.02*	0.31	*0.01*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A11b

Canada

Characteristics of rural and urban schools and communities

	Rural schools		Urban schools		Canada	
	Average	(s.e.)	Average	(s.e.)	Average	(s.e.)
School characteristics						
Schools offering extracurricular activities (%)	92.88	*(0.47)*	92.16	*(0.37)*	92.32	*(0.31)*
Number of 15-year-olds	**466.11**	***(21.20)***	**648.21**	***(11.29)***	608.66	*(10.21)*
K to 12 schools (%)	**11.31**	***(2.05)***	**1.44**	***(0.41)***	3.59	*(0.56)*
Negative teacher behaviours	-0.09	*(0.06)*	-0.13	*(0.03)*	-0.12	*(0.03)*
Negative student behaviours	0.36	*(0.05)*	0.24	*(0.03)*	0.27	*(0.02)*
Teacher morale	0.11	*(0.06)*	0.07	*(0.03)*	0.08	*(0.03)*
Student-teacher ratio	16.69	*(0.22)*	17.08	*(0.11)*	16.99	*(0.10)*
Inadequacy of instructional resources	**-0.03**	***(0.06)***	**-0.29**	***(0.04)***	-0.24	*(0.03)*
Shortage of teachers	**0.25**	***(0.07)***	**-0.05**	***(0.03)***	0.02	*(0.03)*
Professional development (%)	61.83	*(2.46)*	58.66	*(1.33)*	59.36	*(1.17)*
Inadequacy of material resources	-0.34	*(0.05)*	-0.35	*(0.03)*	-0.35	*(0.03)*
Computer availability	**5.64**	***(0.16)***	**7.12**	***(0.19)***	6.79	*(0.16)*
Teacher specialization (%)	**70.21**	***(1.55)***	**83.55**	***(0.67)***	80.46	*(0.65)*
School autonomy	0.11	*(0.06)*	0.24	*(0.03)*	0.21	*(0.03)*
Teacher participation to decision making	0.20	*(0.06)*	0.06	*(0.03)*	0.09	*(0.03)*
Community characteristics						
Population density	**372.72**	***(22.37)***	**1,440.47**	***(50.79)***	1,208.56	*(42.16)*
Adult unemployment rate	**9.59**	***(0.49)***	**8.11**	***(0.10)***	8.43	*(0.13)*
Adult employment rate	**54.81**	***(0.64)***	**60.11**	***(0.23)***	58.96	*(0.24)*
White collar employment	**36.60**	***(0.47)***	**47.65**	***(0.25)***	45.25	*(0.26)*
Post-secondary enrollment	**58.84**	***(0.79)***	**66.83**	***(0.24)***	65.10	*(0.27)*
Post-secondary education	**42.37**	***(0.52)***	**53.54**	***(0.26)***	51.11	*(0.27)*
University education	**14.73**	***(0.37)***	**25.13**	***(0.30)***	22.87	*(0.28)*
Average income ($)	**21,777**	***(265)***	**26,490**	***(162)***	25,467	*(151)*
Average family income ($)	**46,873**	***(570)***	**57,680**	***(404)***	55,333	*(365)*

Note: (s.e.) is the standard error of the average. Items in bold indicate significant differences in average values of variables for urban and rural schools.

Table A12

Significant differences in student characteristics for urban and rural schools

	Nfld.Lab.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Reading achievement	S	S	.	S	.	.	.	.	S	.	S
Mathematics achievement	S	.	.	.	.	.	.	.	.	.	.
Science achievement	S	.	.	S	.	.	.	.	S	.	S
Student cultural activities	S	S	S	S	S	.	S	S	.	S	S
Reading enjoyment	S	.	.	.	.	.	.	.	S	.	S
Homework - students doing 4 or more hours per week (%)	.	.	.	S	.	S	.	S	S	S	S
Career expectations	S	S	S	S	S	S	S	S	S	.	S
Percentage of students who expect to get postsecondary education (%)	.	S	.	.	S	.	S	.	.	.	S
Percentage of students who expect to get university rather than college (%)	S	.	S	S	S	S	S	S	S	S	S
Percentage of student with 30 minutes or more transportation time (%)	.	S	S	S	.	S	S	S	.	S	S
Students participating in school extracurricular activities (%)	S	.	.	.	.	.	S	S	.	.	.
Students participating in non-school extracurricular activities (%)	.	.	.	S	S	.	.	.	.	.	.
Using computer at school at least several times per month (%)	S	S	.	S	.	.	S	S	S	S	S
Using internet at school at least several times per month (%)	.	S	.	S	.	.	S	S	S	.	S
Family characteristics											
Family socio-economic status	S	S	S	S	S	S	S	S	S	S	S
Highest parent educational attainment	S	S	S	S	S	.	S	S	.	.	S
Students with 100 or more books at home (%)	S	.	.	S	S	.	.	.	.	.	.
Parental academic interest	S	S	.	.	S	.	S	.	S	.	S
Parental social interest	.	S	S	.	.	.	.	.	.	.	.
Home cultural possessions	S	S	.	S	S	.	S	S	S	.	S
Home educational resources	S	.	.	S	S	S	S	S	S	.	S
Computer at home (%)	S	S	.	S	S	.	S	.	S	.	S
Internet access at home (%)	S	S	.	S	S	.	S	.	S	S	S
Student's school experience											
Disciplinary climate	.	.	.	.	.	.	.	.	.	.	.
Teacher-student relations	.	.	.	.	.	.	S	.	.	.	.
Teacher support	.	.	.	.	.	.	.	.	.	.	.

Note: S identifies characteristics where the difference between urban and rural schools is statistically significant with a 99% level of confidence.

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Table A13
Significant differences in school and community characteristics for urban and rural schools

	Nfld.Lab.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Schools offering extracurricular activities (%)	.	.	.	.	.	.	.	.	.	.	.
Number of 15-year-olds	S	.	S	S	.	.	S	S	.	.	S
K to 12 schools (%)	S	.	.	.	.	.	S	S	S	.	S
Negative teacher behaviours	.	.	.	.	.	.	.	.	.	.	.
Negative student behaviours	.	.	.	.	.	.	.	.	.	.	.
Teacher morale	.	.	.	.	.	.	.	S	.	.	.
Student-teacher ratio	S	.	.	S	.	.	.	S	.	.	.
Inadequacy of instructional resources	.	.	.	.	.	.	.	S	.	.	S
Shortage of teachers	.	S	.	.	.	.	.	.	.	.	S
Professional development (%)	.	S	.	.	.	.	.	.	.	S	.
Inadequacy of material resources	.	.	.	.	S	.	.	.	.	.	.
Computer availability	.	.	.	.	.	S	.	.	.	.	S
Teacher specialization (%)	S	.	.	.	.	.	S	S	S	.	S
School autonomy	.	.	.	.	.	.	.	.	.	.	.
Teacher participation to decision making	.	.	.	.	S	.	.	.	.	.	.
Community characteristics											
Population density	S	S	S	.	.	S	S	S	S	S	S
Adult unemployment rate	S	S	S	S	.	.	S	.	.	.	S
Adult employment rate	S	.	S	S	S	S	S	S	.	.	S
White collar employment	S	S	S	S	.	S	S	S	S	S	S
Post-secondary enrollment	.	.	.	.	S	S	S	.	S	S	S
Post-secondary education	S	S	S	S	S	S	S	S	S	S	S
University education	S	S	S	S	S	S	S	S	S	S	S
Average income ($)	S	S	S	.	S	S	S	S	S	.	S
Average family income ($)	S	S	S	.	.	S	S	S	S	S	S

Note. S identitifies characteristics where the difference between urban and rural schools is statistically significant with approximately 99% confidence.

Table B1

Size of rural-urban differences controlling for individual student socio-economic status and a variety of community factors

					Controlling for individual SES and.....				
	Actual rural-urban gap in reading achievement	Controlling for individual socio-economic status (SES)	Controlling for individual SES and community factors	... average parental occupational status of school	... average income	... employment rates	... adult university attainment	... average post-secondary attainment	... % of jobs requiring university	... average educational attainment
Newfoundland and Labrador	-37	-27.8	2.1	1.0	-20.0	-17.7	-19.1	-11.9	-15.7	-6.2
Prince Edward Island	-21.9	-14.5	6.3	6.7	-10.4	-13	-5.9	0.4	-2.6	6.3
Nova Scotia	-3.3	1.1	14.3	14.1	5.5	5.5	6.5	8.5	8.1	13.7
New Brunswick	-18.1	-11.4	10.3	10.0	-5.5	-7.7	-5.1	-2.3	-4.2	4.0
Quebec	-10.5	-5.5	7.4	9.6	-2.8	-5.0	1.6	5.3	3.8	7.7
Ontario	-14.8	-9.7	5.3	10.7	-2.2	-5.9	-0.7	2.2	-1.3	-5.5
Manitoba	-3.8	1.4	16.6	17.5	6.2	4.4	9.9	15.8	9.8	14.0
Saskatchewan	-10.1	-4.4	12.9	15.7	2.3	-0.3	2.8	8.4	4.5	5.3
Alberta	-20.9	-16.9	-5.4	-1.1	-12.8	-15.0	-9.5	-5.7	-9.9	-12.6
British Columbia	-9.2	-6.0	2.2	7.1	-3.0	-3.4	-0.5	-0.2	-0.1	-3.7

Table C1

Expected differences in grade 10 rural student performance through maximising school characteristics

	Original predicted grade 10 average	Teacher support	Disciplinary climate	School activities	Student teacher ratio	Student behaviour	Teacher specialization	Standardized testing	Final model
Alberta	541	9	37	6	4	13	4	0	50
Newfoundland and Labrador	504	8	35	5	10	14	3	0	53
Prince Edward Island	507	8	36	5	5	15	4	0	49
Nova Scotia	530	8	36	4	7	14	3	0	50
New Brunswick	496	9	36	8	6	14	3	2	53
Quebec	546	8	31	7	7	14	2	1	49
Ontario	521	8	36	5	9	14	2	0	53
Manitoba	532	9	38	4	8	13	4	0	52
Saskatchewan	530	8	35	5	8	13	5	0	50
British Columbia	533	8	34	4	7	12	2	0	47

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APPENDIX B

Definitions and Concepts

Note: Several of the measures in this report reflect indices that summarise responses from students or school representatives (typically principals) to a series of related questions. It is important to note that negative values in an index do not necessarily imply that students responded negatively to the underlying questions. A negative value merely indicates that a group of students (or all students, collectively, in a single country) or principals responded less positively than all students or principals did on average across OECD countries. Likewise, a positive value on an index indicates that a group of students or principals responded more favourably, or more positively, than students or principals did, on average, in OECD countries.

I. Measures of reading, mathematics and science literacy

Reading literacy is defined in PISA as the ability to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate effectively in society. This definition goes beyond the notion that reading literacy means decoding written material and literal comprehension. Reading incorporates understanding and reflecting on texts. Literacy involves the ability of individuals to use written information to fulfil their goals, and the consequent ability of complex modern societies to use written information to function effectively.

Mathematical literacy is defined in PISA as the capacity to identify, understand and engage in mathematics, and to make well-founded judgements about the role that mathematics plays in an individual's current and future private life, occupational life, social life with peers and relatives, and life as a constructive, concerned and reflective citizen. As with reading, the definition revolves around the wider uses of mathematics in people's lives rather than being limited to mechanical operations. "Mathematical literacy" is used here to indicate the ability to put mathematical knowledge and skills to functional use rather than just mastering them within a school curriculum. To "engage in" mathematics covers not simply physical or social actions (such as deciding how much change to give someone in a shop) but also wider uses, including taking a point of view and appreciating things expressed mathematically (such as having an opinion about a government's spending plans). Mathematical literacy also implies the ability to pose and solve mathematical problems in a variety of situations, as well as the inclination to do so, which often relies on personal traits such as self-confidence and curiosity.

Scientific literacy relates to the ability to think scientifically in a world in which science and technology shape lives. Such literacy requires an understanding of scientific concepts as well as an ability to apply a scientific perspective. PISA defines scientific literacy as the capacity to use scientific knowledge, to identify questions, and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity.

II. Individual, family, and school characteristics

Reading Enjoyment: This index was derived from students' level of agreement with the following statements: I read only if I have to; reading is one of my favourite hobbies; I like talking about books with other people; I find it hard to finish books; I feel happy if I receive a book as a present; for me reading is a waste of time; I enjoy going to a bookstore or a library; I read only to get information that I need; and, I cannot sit still and read for more than a few minutes.

Students' cultural activities: This index was derived from students' reports on how often they had participated in the following activities during the preceding year: visited a museum or art gallery; attended an opera, ballet or classical symphony concert; and watched live theatre.

Homework time: This variable was collected as part of the Youth in Transition Survey (YITS). Students were asked about how many hours per week they usually spend on homework outside class (during free periods and at home).

Career expectations: Students were asked to report what kind of job they expect to have when they are about thirty years old. This information was then classified by occupational status according to the International Socio-Economic Index of Occupational Status (ISEI) (defined under socio-economic status).

Student's education expectations: This variable was collected as part of the Youth in Transition Survey (YITS). Students reported what is the highest level of education they would like to get.

Transportation time: This variable was collected as part of the Youth in Transition Survey (YITS). Students were asked how long it usually takes them to travel to school one way. This variable included use of all forms of transportation.

Participation in school extracurricular activities: This variable was collected as part of the Youth in Transition Survey (YITS). Students were asked how many total hours per week they usually spend participating in school clubs, teams or other school-based extracurricular activities.

Participation in non-school extracurricular activities: This variable was collected as part of the Youth in Transition Survey (YITS). Students were asked how many total hours per week they usually spend participating in non-school clubs, teams, lessons or other non-school organised activities.

Computer and Internet at home: Students were asked how many computers they had in their home and whether they had a link to the Internet in their home.

Computer and Internet use at school: Students were asked how often they use computers and the Internet at school.

Parents' occupational status: Students were asked to report their mothers' and fathers' occupation, and to state whether each parent was: in full-time paid work; part-time paid work; not working but looking for a paid job; or "other". The open-ended responses were then coded in accordance with the International Standard Classification of Occupations (ISCO 1988).

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The PISA International Socio-Economic Index of Occupational Status (ISEI): was derived from student responses on parental occupation. The index captures the attributes of occupations that convert parents' education into income. The index was derived by the optimal scaling of occupation groups to maximise the indirect effect of education on income through occupation and to minimise the direct effect of education on income, net of occupation (both effects being net of age). For more information on the methodology, see *Ganzeboom, de Graaf and Treiman (1992)*. The PISA International Socio-Economic Index of Occupational Status is based on either the father's or mother's occupations, whichever is the higher.

Parent's educational attainment: This variable was derived as the highest level of attainment achieved by either parent.

Number of books at home: Students reported an estimate of how many books there are in their home. They were given a calculation that there are approximately 40 books per metre of shelving and were asked not to include magazines.

Parental academic interest: The index of parental academic interest was derived from students' reports on the frequency with which their parents (or guardians) engaged with them in the following activities: discussing political or social issues; discussing books, films or television programmes; and listening to classical music.

Parental social interest: This index was derived from students' reports on the frequency with which their parents (or guardians) engaged with them in the following activities: discussing how well they are doing at school; eating the evening meal with them around a table; and spending time simply talking with them.

Home cultural possessions: This index was derived from students' reports on the availability of the following items in their home: classical literature (examples were given), books of poetry and works of art (examples were given).

Home educational resources: This index was derived from students' reports on the availability and number of the following items in their home: a dictionary, a quiet place to study, a desk for study, textbooks and calculators.

Disciplinary climate: This index summarises students' reports on the frequency with which, in their <class of the language of assessment>: the teacher has to wait a long time for students to quiet down; students cannot work well; students don't listen to what the teacher says; students don't start working for a long time after the lesson begins; there is noise and disorder; and, at the start of class, more than five minutes are spent doing nothing. High values indicate greater problems with disciplinary climate.

Teacher-student relations: This index was derived from students' reports on their level of agreement with the following statements: students get along well with most teachers; most teachers are interested in students' well-being; most of my teachers really listen to what I have to say; if I need extra help, I will receive it from my teachers; and most of my teachers treat me fairly.

Teacher support: This index was derived from students' reports on the frequency with which: the teacher shows an interest in every student's learning; the teacher gives students an opportunity to express opinions; the teacher helps students with their work; the teacher continues teaching until the students understand; the teacher does a lot to help students; and, the teacher helps students with their learning.

School size: Number of 15-year olds in school

Schools offering extracurricular activities: This index is the proportion of students in a school reporting that their school offers extracurricular activities.

Negative teacher behaviour: This index was derived from principals' reports on the extent to which the learning by 15-year-olds was hindered by: the low expectations of teachers; poor student-teacher relations; teachers not meeting individual students' needs; teacher absenteeism; staff resisting change; teachers being too strict with students; and students not being encouraged to achieve their full potential. High values indicate higher levels of negative behaviour.

Student behaviour: This index summarises principals' perceptions of the school's disciplinary climate by reporting the extent to which learning by 15-year-olds in their school was hindered by: student absenteeism; disruption of classes by students; students skipping classes; students lacking respect for teachers; the use of alcohol or illegal drugs; and students intimidating or bullying other students. High values indicate problems with student behaviour.

Teacher morale and commitment: This index was derived from the extent to which school principals agreed with the following statements: the morale of the teachers in this school is high; teachers work with enthusiasm; teachers take pride in this school; and teachers value academic performance.

Student-teacher ratio: This index is the ratio between the school size and the total number of teachers. Part-time teachers contributed 0.5 and full-time teachers 1.0 to the total number of teachers.

Teacher shortage: This index was derived from the principals' views on how much learning by 15-year-old students was hindered by the shortage or inadequacy of teachers in the <language of assessment>, mathematics or science. High values indicate problems with teacher shortage.

Inadequacy of instructional resources: This index was derived based on the school principals' reports on the extent to which learning by 15-year-olds was hindered by: not enough computers for instruction; lack of instructional materials in the library; lack of multi-media resources for instruction; inadequate science laboratory equipment; and inadequate facilities for the fine arts. High values indicate a low quality of educational resources.

Inadequacy of material resources: This index was derived from principals' reports on the extent to which learning by 15-year-olds in their school was hindered by: poor condition of buildings; poor heating and cooling and/or lighting systems; and lack of instructional space (e.g., classrooms). High values indicate a low quality of physical infrastructure.

Computer availability for students: This index is the ratio of the principals' report on the number of computers in the school available to 15-year-olds and the number of 15-year-olds in the school represented by the sample.

Teacher specialisation: This index was computed from 3 variables describing the percentage of teachers in reading, mathematics, and science, respectively, teaching in their area of specialisation.

School autonomy: This index was derived from principals' reports on whether or not various aspects of school management (hiring and firing teachers, determining initial and incremental salaries, formulating school budget, determining student disciplinary and assessment policy, approving student admittance, choosing textbooks and course content, and deciding which course are offered) were a school responsibility.

Teacher participation in decision making: This index was derived from principals' reports on whether or not teachers have the main responsibility, within their school, for the aspects of school management described above for school autonomy.

(Community) Aggregate parental occupational status: This variable was derived as the average of the highest parental occupational status (ISEI) reported by all students in a school. The variable was then used as a characteristic for each student in the school as a proxy for the occupational status of adults in the community.

III. What is a rural school?

There are a variety of ways to define *rural* using the Census geographic information on the location of schools. There is no single recommended definition. Rather, the choice of how to define *rural* depends on the nature of the analysis carried out. For this analysis, a variety of Statistics Canada standard geographic variables were explored in determining what should be considered a *rural* school for the purposes of this analysis in addition to information provided in the PISA school questionnaires. In this report, rural schools are defined as those schools located outside large urban centres (CMA or CA). That is, in terms of Statistics Canada definitions, rural schools are those in *Rural and Small Towns (RST)*.

Census rural area: The most commonly used definition, *Census urban area*, refers to communities of at least 1000 people, and a population density of at least 400 per square kilometre. *Census rural* refers to communities that do not meet this criterion.

Census Metropolitan Area (CMA) and Census Agglomeration (CA): These are urban cores, together with adjacent rural and urban areas that have a high degree of economic and social integration with that urban area. A CMA is the area around an urban core with a population of at least 100,000. A CA surrounds an urban core of at least 10,000. In CMAs and CAs, land is designated as being part of an urban core, urban fringe or rural fringe. Certain rules with respect to population and density are used to make the urban designations. Outside CMAs and CAs, land is also designated as urban area (census urban) using the same rules. Area not designated urban is considered rural (census rural).

Rural and small town (RST): This definition refers to populations living outside the commuting zone of larger urban centres (outside of CMAs and CAs.)

Rural postal codes: Areas serviced by rural route delivery from a post office or postal station. These areas are identified by the use of a 0 in the second position of the postal code.

In addition to these Statistics Canada, geographic concepts, information on community size was collected in the PISA school questionnaire. Principals were asked about the size of the community in which the school was located based on population size: village or rural area, small town, town, city (of 100,000 to about 1 million), close to a city of over 1 million, in a city of over 1 million. It should be noted that the population size of a community does not necessarily provide information about the rural or urban nature of that community in terms of access to and integration with an urban centre. A comparison of this variable with the CMA/CA definition used in this analysis shows that 32% of students in schools identified by principals as being in villages or small towns, were in fact in schools located within Census Metropolitan Areas or Census Agglomerations.

Number of 15-year olds by location of school using definition based on Rural and Small town (non-CMA/CA) compared to community size collected in PISA questionnaire

PISA principal questionnaire	CMA/CA (urban)	RST (rural)	Total
Village (less than 3,000)	6,522	26,673	33,195
Small town (3,000 to 15,000)	27,711	47,552	75,263
Town (15,000 to 100,000)	90,971	674	91,645
City (100,000 to 1,000,000)	100,587	0	100,587
City (more than 1,000,000) city centre	23,335	0	23,335
City (more than 1,000,000) elsewhere	17,324	0	17,324
Total	**266,450**	**74,899**	**341,349**

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APPENDIX C

Analytical methodology

The analysis of rural-urban differences in student performance was carried out in three phases. The first stage was an examination of a variety of individual, family, school and community characteristics to identify any significant and systematic differences between students in rural and urban schools. The second phase then used a hierarchical (multilevel) regression model to identify the characteristics that best explain the difference between the rural and urban PISA results. Finally, a variety of school characteristics were explored to identify factors which could be further analysed as potential tools for improving rural student performance.

Phase 1

Examination of differences in the school populations of rural and urban schools

In order to answer the question why there are differences between the reading performance of the two populations, the first phase of the analysis was to identify other ways in which the populations differed.

The variables in this analysis came from three sources: 1) student reported variables on individual behaviour and family background from the PISA and YITS student questionnaires, 2) principal reported variables from the PISA school questionnaire, and 3) community level variables from the 1996 Census aggregated for Census Sub-division (CSD) geographic units linked to schools using postal code information.

Given the complex sample of the PISA assessment, group mean characteristics at the student level were estimated using replication methods. The statistics were estimated using 80 different weightings of the sample. The set of replication weights, produced by Westat, was designed to be consistent with PISA sampling (see below). For each statistic, the variance between the 80 different estimates was proportional to the variance of estimation. For further information on the analytical treatment of PISA sampling, see the *PISA 2000 Technical Report* (Adams and Wu, 2002). These methods were implemented using the software WesVar 4.0 (2001).

At the school level, the comparison of rural and urban schools was complicated by the nature of the school sample. Since schools were the first-stage sampling unit (see below), statistics estimated using the school design weights produced estimates that generalised to the population of schools that enrolled 15-year-olds, but did not generalise to the school environment of 15-year-olds. To illustrate the distinction, consider that a small minority of 15-year-olds repeated a grade and were attending lower secondary schools. Similarly, a small minority of 15-year-olds were attending schools with extremely small populations. These schools would be considered equal in estimating average school characteristics to larger, upper secondary schools that are more typical for 15-year-olds. Using the school design weights to estimate average

school characteristics would produce average school characteristics that were actually unrepresentative of the school environment experienced by the average 15-year-old.

In order to remedy this inconsistency, school weights were constructed using school aggregations of student weights. Thus, statistics produced using these weights are generalizable to the environments experienced by 15-year-olds. Unfortunately, this method does not come with a sample-appropriate statistical method for estimating the precision of statistics. Thus, in order to estimate variances to be used in statistical tests, the aggregated weights were normalised across the sample of schools (divided by a constant, such that the sum of the normalised weights was equal to the number of schools sampled). Using normalised weights, variance estimates were calculated under the assumption of simple random sampling of schools. However, given that this method did not take into account any sample design complexities, it is likely that the variance estimates were an underestimation of true variances[13]. Therefore, the test level of significance was changed from the typical 5% error rate to a 1% error rate. One expects that increasing the stringency of the statistical test should offset the possible underestimation of variance.

Having identified many variables that distinguished rural and student populations, several hypotheses were developed about possible causes for the group differences across a wide variety of characteristics, particularly in our variable of interest, reading performance. For example, student career expectations, parental occupational status and education, and community-level factors all showed consistent differences in favour of urban communities. However, other variables, such as school characteristics and student attitudes (within-community variables) were inconsistent in terms of group differences. The systematic difference in community characteristics between rural and urban schools led to an analysis of community level variables in order to explain the systematic differences at the individual level.

Phase 2

Analysis of impact of individual and community level variables on rural student performance (Model Set 1)

In order to test the effects of community level variables on group-averaged individual performance, it was necessary to produce a complex model that could account for some of the complexity of the system, while still allowing us the statistical power to estimate relationships between the variables.

The goal in this phase of the analysis was to predict the average outcome value for one group (focus group – rural school populations) if they had the average characteristics of another group (reference group – urban school populations). In order to accomplish this, all explanatory variables used in the model were centred on the average value of the reference group (so the average of the transformed values is equal to the mean of the reference group). This results in a much more interpretable model, since the intercept term of the regression equation now refers to the predicted average of the population if the average of the predictor(s) for the population was the reference group average. Another interpretation is that the intercept

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term is the predicted value for all cases that have the predictor value equal to the average of the reference group. In the case of this analysis, the intercept would be the mean for the urban school population.

However, it was important in this analysis to examine rural-urban differences within provincial jurisdictions since education systems are governed provincially and it is more meaningful to compare rural school populations to urban school populations within provinces. This means that the model needed to account for provincial differences without explaining provincial differences. In order to accomplish this, all explanatory variables were transformed so that they did not reflect differences between provinces. This required that, for each province, all explanatory variables were adjusted within-province. Since the objective of this analysis was to predict outcomes for students with average individual and community characteristics of the reference groups, variables were adjusted around the mean of the reference group for each province. As a result, each predictor variable used in this set of models was of the form:

$$x^{*}_{jk} = x_{jk} - x_{\bullet u * k} \qquad (1)$$

where

x^{*}_{jk} is the final, transformed value of variable x for case j in province k that was used in the regression models

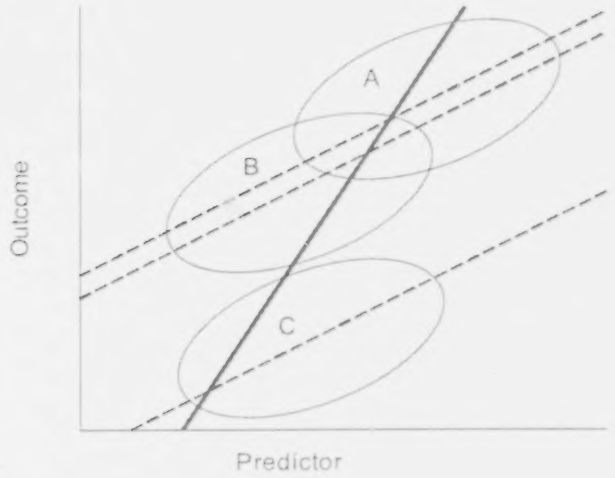
x_{jk} is the raw, untransformed value of the variable for case j in province k

$x_{\bullet uk}$ represents the average value of the variable for the urban cases in province k

Because the predictors had been centred around the urban mean for each province, but no similar adjustment had been made to the outcome variable (reading performance), it was necessary to include dichotomous variables that indicated province, as well as an indicator variable indicating if a school was rural within each province.

Figure 6

An illustration of provincial differences in predictor and outcome, with a constant relationship



The justification for these adjustments is that many of the community characteristics used to describe differences in rural and urban performance vary between provinces. Unfortunately, the educational policies that determine outcomes, perhaps to a greater degree than community conditions, are also systematically different between provinces. It is possible that a province with systematically higher socio-economic conditions will have systematically different educational policies. This confound is illustrated in Figure 1, which presents 3 hypothetical provinces, each with systematically different locations in terms of both predictor and outcome. The traditional scatterplots are represented here as ovals. The relationship between predictor and outcome is the same in each province, indicated by the parallel lines bisecting each oval. However, since the provinces are systematically different in terms of these variables, the observed effect if all the provinces were considered simultaneously would be much different (shown here as the solid line). However, this overestimated relationship would be an artefact of systematic differences between provinces, instead of the actual relationship between variables.

By centring the predictor within-province, the effect of provincial membership is negated (see Figure 2). Since the average value of the predictor is now identical for each province, the distributions have been aligned horizontally. The distributions remain displaced vertically, which has the effect of attenuating the observed relationship, shown here by the flatter solid line. In order to account for this displacement, it is necessary to include variables that account for provincial membership. Since the distributions are already aligned according to the predictor, the variable accounting for provincial membership only describes the differences between provincial means. The resulting distributions, with both within-province centring and provincial indicators, are shown in Figure 3. The distributions have been effectively overlain on top of each other, and observed relationship is now equal to the actual relationship within each province.

Figure 7

The effect of centring variables within-province

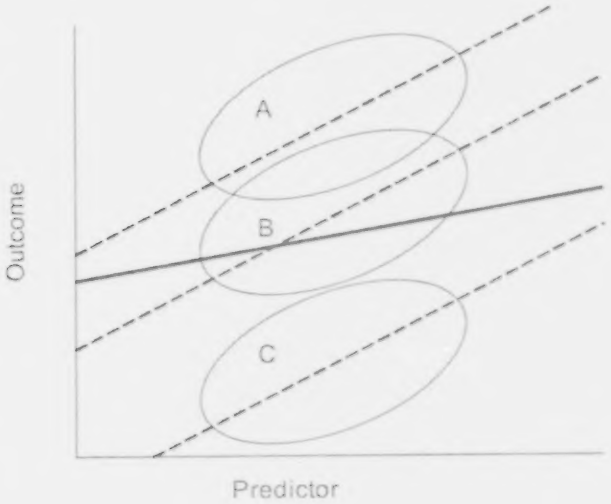
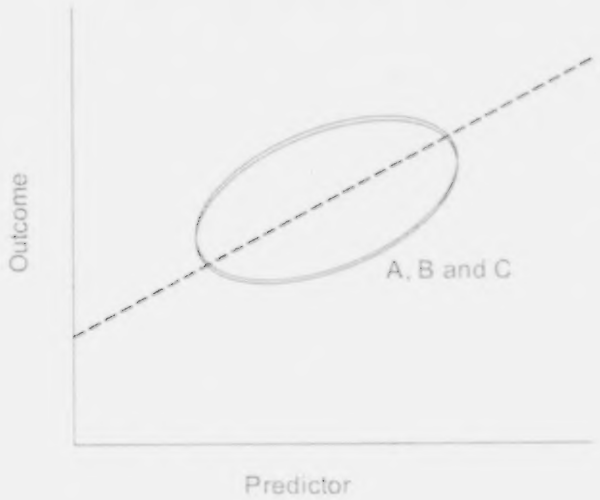


Figure 8

The combined effect of centring and use of provincial indicators



For every model, there were a total of 9 province variables (10-1) and 10 rural-urban variables (1 for each province). The provincial indicators were dummy-coded (for an explanation of dummy coding, see Cohen and Cohen, 1983, pp. 183-220) against the reference group of Alberta, and the rural-urban indicators were dummy coded against the urban group within each province. This meant that the intercept term for the regression equation represented the average performance of urban students in Alberta. The regression coefficient for each indicator variable represented an adjustment from the urban Alberta average. The averages of students in urban school in other provinces would be adjusted by the value of the provincial indicator coefficient, while averages of students in rural school would be adjusted by both the provincial indicator coefficient and the rural-within-province indicator coefficient. These adjustments to the model allowed us to account for the differences between provinces without explaining them. For example, since the difference between average Alberta urban performance and average Newfoundland and Labrador urban performance is perfectly accounted for by the variable indicating which schools are in Newfoundland and Labrador, we can account for the interprovincial variation in performance without explicitly defining why it exists.

If we represent the vector of average performance within each school as B_0, the vector of provincial indicators as P and the vector of within-province rural indicators as R, the basic model that accounts for the differences between rural and urban groups in the different provinces is:

$$B_0 = G_{00} + G_{01}P + G_{02}R + \sum G_{0l}Sl_l + U \qquad (2)$$

where G_{00} is the average performance of students in urban Alberta schools, G_{01} is the vector of differences between the urban performance in Alberta and the other provinces, G_{02} is the vectors of values describing the difference between rural and urban performance in each province, and U is a vector of school residuals from their predicted provincial-geographic group means. The summation term across G_{0l} represents the combined effects of any community characteristics, Sl_l, used in the model. However, in order to account for the wide variation within each school in terms of performance, the model above (2) was combined with a student level model, Equation (3), that describes individual students' performance, A, as a sum of the school average performance, B_0, and within-school residuals for each student, E. The resulting model obtained by substituting (2) into (3), accounts for both differences between school averages and between individual students within each school (4).

$$A = B_0 + E \qquad (3)$$

$$A = G_{00} + G_{01}P + G_{02}R + \sum G_{0l}Sl_l + R + E \qquad (4)$$

Another consideration in the analysis of macro level variables on groups of individuals is that there is a risk of confounding group characteristics with the aggregate effect of individual characteristics. For example, a group characteristic may have a relationship to the average group outcome, but this relationship may

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simply be the aggregate effect of correlated characteristics of individuals within the group. In other words, if average income seems to be related to average performance, it is important to be certain that this is not simply because individual income is related to individual performance. In order to control for this situation, all models used in this analysis controlled for the socio-economic conditions of individuals. Again, these variables were centred within-province around the average of the reference group. This required an adjustment to Equation (2), so that the jth element of B_0 represents the predicted average performance of students in school j if all the students in the school had families with average urban characteristics. The new individual-level model is represented as:

$$A = B_0 + \sum B_p X_p + E \qquad (5)$$

where the X_p represents a matrix of individual variables describing individual family socio-economic characteristics, centred on the urban average, and B_p is a matrix of the regression coefficients of these variables onto individual performance, estimated within each school. The two individual level variables used to describe family socio-economic characteristics were the highest parental occupational status and the highest parental educational attainment. The final model used to describe differences in student performance, combining (2) and (5) is:

$$A = G_{00} + G_{01}P + G_{02}R + \sum G_{0l}S1_l + \sum B_p X_p + R + E \qquad (6)$$

The elements in G_{00}, G_{01}, and G_{02} now describe the predicted average performance of the relevant groups if the average characteristics ($S1_l$ and X_p) of each group were equal to the within-province average urban characteristics. If all $S1_l$ and X_p are empty, which is equivalent to modelling the group differences without any predictor variables, combining the elements in G_{00}, G_{01}, and G_{02} will produce the observed averages for each group. Since the urban schools in Alberta had the highest average performance of any other of the provincial geographic groups, the elements in G_{01} will all be negative, describing the deviation of each province's urban average from Alberta's. Furthermore, since the urban averages were higher than rural in all provinces, the elements in G_{02} will also be negative, describing the deviation of each provincial rural average from the provincial urban average. By increasing the number of predictors, we are attempting to reduce the absolute values in G_{02} by explaining the differences between rural and urban performance. Since the reference urban groups already have average urban characteristics, elements in G_{00} and G_{01} will not change in value. However, if the characteristic, $S1_l$, has some power in explaining the difference in performance between students in rural versus urban schools, then the values in G_{02} will become less negative. In general, as the elements of G_{02} increase in relative value, we are explaining more of the difference between rural and urban performance. If the elements become positive, then it suggests that students in rural schools are performing better than predicted, given the conditions we have modelled. The predicted performance of rural students in all provinces is calculated by adding the corresponding elements in $G_{01}P$ and $G_{02}R$ to G_{00}.

Phase 3

Analysis of the potential impact of school-level variables on rural student performance (Model Set 2)

This last phase of the analysis took into consideration that the community context of schools is not easily changed. However, given that schools do exist within specific context(s), it is useful to identify school variables which were not reported at the highest levels and which were associated with high student achievement. This model set looked specifically at the predicted performance of rural students, given the particular characteristics of rural communities and their effects noted in Model Set 1.

When talking about the effects of school conditions, there is a risk that there are a variety of confounding variables. In particular, because the population for PISA is 15-year-olds and is not school grade specific, many schools in the PISA sample were early-secondary or middle schools where the 15-year-olds were likely students who had been held back a grade at some point in their academic history. Thus, the average of these schools is expected to be lower, simply because of the systematic differences in their sample of students. In order to control for this spurious relationship, a variable describing each student's school grade was introduced. The model appeared as follows:

$$A = G_{00} + G_{01}P + G_{02}R + \sum G_{0m}S2_m + B_1 GRADE + \sum B_p X_p + R + E \qquad (7)$$

where GRADE describes the grade of a student, a discrete whole number variable, centred on 10. Thus, the elements in G_{00}, G_{01}, and G_{02}[14] now describe the predicted performance of grade 10 students in each provincial geographic region. $S2_m$ and B_p represent vectors of a school socio-economic characteristics and individual socio-economic characteristics, respectively, centred on the rural average for each province. This model set includes all predictors identified in Model Set 1. The G_{00} coefficient describes the predicted average performance of rural grade 10 students in Alberta. Since G_{02} indicates rural or urban location of each school, the summation term across all $S2_m$ and B_p vectors does not affect the predicted provincial rural averages. These variables are included in order to reduce the chances of observing spurious relationships between performance and the variables tested in this second model set.

Using this base model, several school policy variables were introduced in order to determine their effect on student performance, while controlling for the important community variables identified in Model Set 1. In order to identify important variables, the variables tested in the model were centred on their maximum values (in other words, the variables described the difference between the actual value and the desirable value):

$$x^*_j = x_j - x_{maximum} \qquad (8)$$

where

x^* is the final, transformed value of variable x for case j that was used in the regression models

x is the raw, untransformed value of the variable for case j

$x_{maximum}$ represents the maximum value of the variable

For certain variables, such as the number of 15-year-olds in a school, the relationship appeared to be non-linear. For variables with non-linear relationships, the following transformation was performed:

$$x^{*2}{}_j = \left(x_j - x_{maximum}\right)^2 \qquad (9)$$

This 2nd order term was combined with the 1st order term in order to estimate the non-linear effect of the variables.

The following table presents the values used as maximum for each variable. These values were determined by examining the bivariate relationships and scatterplots of each variable with school average performance. For linear relationships, the maximum value was fixed as the minimum or maximum observed value for a variable, depending on whether the bivariate relationship between the variable and performance was negative or positive, respectively. For non-linear relationships, maximum values were specified based on literature, if available, and observed maxima in scatterplots.

Variable	Maximum	Value
Teacher support	Maximum observed score	1.61
Disciplinary climate	Minimum observed score	-1.54
School activities	Maximum proportion of students reporting that school offers activities	1.00
Achievement press	Maximum observed score	1.38
Professional development	Maximum % of teachers with recent professional development	100%
Instructional hours	Minimum observed total hours of instruction	100
Student-teacher ratio	25 students per teacher	25
Teacher behaviour problems	Minimum observed score	-2.41
Student behaviour problems	Minimum observed score	-2.61
Teacher morale	Maximum observed score	1.78
School autonomy	Maximum observed score	1.72
Teacher participation	Maximum observed score	3.70
Teacher specialisation	Maximum proportion of teachers teaching in their specialisation	1.00
Number of 15-year-olds	Various values between 100 and 400 15-year-olds were tested	100-400
Standardised testing	Using standardised tests either less than or more than 2 times per year	na

Thus, the elements of G_{00}, G_{01}, and G_{02} in the full model sum to produce the predicted average performance for rural students in each province if all schools were to have maximum values on the predictors included, while controlling for socio-economic characteristics. For example, if the Alberta rural average for proportion of teachers specialising in their instructional content area were 80%, the model predicts what average rural performance would be if that proportion were 100%. This final model is defined as

$$A = G_{00} + G_{01}P + G_{02}R + \sum G_{0m}S2_m + \sum G_{0n}S3_n + B_1 GRADE + \sum B_p X_p + R + E \quad (10)$$

where $S3_n$ represents the difference between a school variable and its maximum value. This model was used to identify variables which were not reported at the highest levels and, b) predict a significant change in student performance if they were given maximum values.

Constraints on this analysis

The first consideration in modelling these data was that the issue of estimating standard deviations from a complex sample had not yet been resolved. As a result, the traditional interpretation of effect sizes, which rely on accurate estimation of population standard deviations, to interpret the relative relationships between variables, could not be done. Thus, the analysis was constrained to fitting models and predicting values according to the fitted models, rather than reporting and interpreting effect sizes. An unexpected benefit of this method is that the results are much more communicable to a lay audience, since predicted averages are closer to common experience than are standard deviations and regression coefficients.

All coefficients in Phases 2 and 3 were estimated using hierarchical ordinary least squares (OLS) estimation for both within-school and between-school effects. The models were replicated across the 5 plausible values describing the posterior density function for each individual's reading performance, and the results of the five analyses were averaged to produce the final reported estimates. Within school (individual) effects were allowed to vary randomly between schools. The software used for estimation of coefficients was HLM 5 (Raudenbush, S., Bryk, T., & Congdon, R, 2000). Although this software also produces optimal estimates using Bayesian estimation for individual level effects, vector B_1, a consequence of this technique is that school averages shrink towards the grand average (see Chapter 3, Bryk and Raudenbush, 1992). As a result, the predicted means for provinces would no longer be equivalent to the observed means, which have already been published. The potential cost of using the OLS estimates is instability in the estimation of predicted school averages, given the individual level model. Analysis of the distribution of OLS predicted averages indicates a greater variability in predicted means than was observed in the actual data. This variability disappears when within-school effects are fixed, rather than left to vary. However, the predicted provincial/geographic averages (the only reported statistics from these sets of models) are stable whether the within school effects are treated as fixed or not. Thus, the trade-off between consistency and optimisation was decided in favour of consistency, and the OLS estimates were used rather than the Bayesian estimates. If individual-

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level effects varied significantly between schools according to a chi-squared test of significance, the effects were left to vary; otherwise, they were treated as fixed. All statistical tests in these models were at the 0.05 level.

Other algorithms for modelling these effects were considered, in particular, the disaggregation of school and community characteristics onto individual students. Aside from the violation of the assumption of independence, given the clustering of students in schools, the results produced using this method were relatively unstable, in that the urban averages, which should remain constant across models given the data transformations described above, varied noticeably.

Both model sets rely on several assumptions, particularly that the variables being measured (or their second-order transformations) have a linear relationship with performance. This is a basic assumption of regression, and the tenability of it was examined through scatterplots. It was also assumed that the slope of these relationships did not differ between provinces (see explanation of Model Set 1, above). This assumption provides the analysis with greater power to estimate school effects. Although there is no reason to believe that effects should differ between provinces, excepting random sample-dependent fluctuations, this assumption was untested in this analysis.

A major limitation of this analysis is the limited number and descriptive power of the variables available. It is possible that other variables describing socio-economic conditions or social capital would produce a clearer picture of community effects. Likewise, many aspects of school environments, such a principal leadership, school climate, and community-school interaction, were unavailable for this analysis. As more data are released as part of the ongoing YITS/PISA projects, better indicators of school and community variables will become available, enriching this type of analysis.

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APPENDIX D

Survey Concepts, Methodology and Data Quality

The following information should be used to ensure a clear understanding of the basic concepts that define the data provided in this report, of the underlying methodology of the survey, and of key aspects of the data quality. This information will provide a better understanding of the strengths and limitations of the data, and of how they can be effectively used and analysed. The information may be of particular importance when making comparisons with data from other surveys or sources of information, and in drawing conclusions regarding change over time, differences between geographic areas and differences among sub-groups of the target population.

Survey objectives: The Youth in Transition Survey (YITS) is a new Canadian longitudinal survey designed to examine the major transitions in young people's lives, particularly with respect to education, training and work. Information on the skills of the 15-year-olds who participated in YITS was also collected as part of the Programme for International Assessment (PISA).

Target population

The target population of the 15-year-old cohort of YITS/PISA are all youth who were 15-years-old as of December 31, 1999 who were enrolled in an educational institution in Canada.

Sample design

The sample for PISA/YITS was selected in two-stages. In the first stage, the frame was a list of all provincially governed public and private schools where students born in 1983 were enrolled for the 1998/1999 school year. Strata of schools were created to ensure adequate coverage of all ten provinces, as well as of minority language school systems in Nova Scotia, New Brunswick, Quebec, Ontario, and Manitoba. The size of the school, measured by the enrolment of students born in 1983, was the final stratification variable. In strata containing the largest schools, all schools were selected, whereas in other strata representing schools of size 35 or more, schools were randomly sampled in proportion to the enrolment of students born in 1983.

Within strata of schools smaller than size 35, schools were randomly sampled with equal probability. In the second stage, students were sampled randomly from a list of the 15-year-olds enrolled in the school. In most strata a maximum of 35 students were sampled, but school sample sizes greater than 35 were required in some province/language classes to meet data quality requirements. In schools with fewer than 35 eligible students, all were selected.

Stratification: In Canada, the selection of schools was carried out to ensure adequate coverage of all ten provinces, as well as of minority language school systems in Nova Scotia, New Brunswick, Quebec, Ontario, and Manitoba.

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Within the context of the sampling standards of PISA, some schools and some students were excluded from the study. Schools in the Yukon, Northwest Territories and Nunavut (0.43% of the target population), as well as schools on Indian reserves (0.73%) were not included in the sampling frame. In addition students who were mentally or physically disabled in such a way that they could not perform in the PISA assessment and non-native speakers with less than one year of instruction in the language of assessment, as well as schools that teach only these students, could be excluded from the study. Schools with enrolment of fewer than 3 students in the target population were also excluded from the study.

Total population 15-years old	403,803
Total enrolled population	396,423
Total in target population	391,788
School-level exclusions	2,035
Percentage of school-level exclusions	0.52%
Number of participating students	29,687
Weighted number of participating students	348,481
Number of excluded students	1,584
Weighted number of excluded students	16,197
Student (within-school) exclusion rate	4.44%
Overall exclusion rate	4.94%

Source: OECD, PISA 2000 Technical Report

Collection

PISA Assessment

The PISA 2000 survey included a direct assessment of students' skills through reading, mathematics and science tests. A total of about seven hours of test items were administered, with each student taking a two-hour-long assessment consisting of different combinations of test items. The assessment focused mainly on reading, with the reading test giving three sub-test scores labelled *retrieving information, interpreting* and *reflecting*. Mathematics and science each had only a single score. In addition, as minor domains, fewer mathematics and science items were included and these items were administered to a random sub-sample of PISA participants within each participating school.

In Canada, students were assessed in English or French according to their main language of instruction as determined by the school.

Student, school and parent questionnaires

Students also completed a 20-minute questionnaire focussing on factors contributing to student performance and a three-minute questionnaire focussing on information technology. In addition, PISA 2000 included a questionnaire, which was administered to school principals, to collect information about the characteristics of participating schools.

A 30-minute self-completed contextual questionnaire from the Youth in Transition Survey was administered simultaneously to students in order to collect more information on their school experiences, their work activities and their relationships with others. A 30-minute interview was also conducted with a parent of each student.

For further information on the technical background of PISA (including response rates), see Annex A of the international OECD report *Knowledge and Skills for Life - First results from the OECD Programme for International Student Assessment,* and the *PISA 2000 Technical Report*. These reports are available on the Internet at www.pisa.oecd.org.

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Endnotes

1 According to the OECD preliminary results of the Programme for International Student Assessment, Canada is one of the countries where the range in student achievement is due less to differences between schools, than to differences in students within schools. The countries, like Canada, where these "between-school" differences are relatively small, tend to be the highest performing countries. The fact that Canadian schools are relatively uniform is therefore seen as one of the reasons why Canada performed so well compared to other countries. (Knowledge and Skills for Life, OECD, Paris, 2001)

2 The location of schools rather than students' homes was used for this analysis because one important aspect of this study is to identify whether differences in the schools themselves are important factors in urban – rural differences. While it is also important to understand the location of students' homes, this information was not available for this analysis.

3 The PISA 2000 assessment tested students in reading, mathematics and science literacy. However, only a sub-sample of students was tested in mathematics and science. As a result, a full analysis of mathematics and science literacy in rural and urban student populations was not possible due to restrictions of sample size. For example, partly as a result of sample size, differences in the mathematics and science performance of rural and urban students were not statistically significant in most provinces. In mathematics, only in Newfoundland and Labrador was there a significant difference between the performance of rural and urban students. In science, rural-urban gaps were significant only in Newfoundland and Labrador, New Brunswick and Alberta.

4 In Newfoundland and Labrador, Prince Edward Island, New Brunswick and Alberta, the difference in reading performance of rural and urban students was statistically significant with a 99% level of confidence. In Ontario, the rural-urban gap was significant with a 95% level of confidence.

5 The PISA assessment was implemented in each province through provincial ministries of education. On-reserve schools that do not fall within provincial jurisdiction were not included in the PISA study. As a result, there will be some under-coverage of rural student populations.

6 Family socio-economic background was derived from student responses regarding parental occupation using the International Socio-economic Index of Occupational Status (see Appendix B for definition). This scale was also used to derive occupational status for student career aspirations.

7 In Alberta and Ontario, the rural-urban difference in cultural activities is significant with a 95% level of confidence, but not at the 99% level generally used to measure statistical significance in this paper.

8 In spite of these variations in the amount of time spent getting to school, there was no relationship between transportation times and reading performance. In fact, additional analysis of this data also showed that there was no relationship between transportation times and participation in extracurricular activities or a student's sense of belonging. However, issues surrounding the transportation of students to and from school are complex and extend beyond the impact on academic performance. Concerns over student transportation also involve matters such as student safety as well as the costs of transportation relative to school budgets. This analysis is unable to fully explore all of the elements of this issue, nor does it consider the possible impact on students of transportation times in earlier grades.

9 It should be noted that this does not mean that many of these youth will not end up going to university, especially given the opportunities for university preparation and transfer programs in colleges and CEGEPs. As the 18 to 20-year old cohort of YITS are still at the beginning of their studies, it is still too early to determine the highest level of education they will attain.

10 For the most part, the schools in the PISA sample are high schools or include high school grades. However, because the study is representative of 15-year-olds, it includes a mix of schools and grades as some 15-year-olds can be found in earlier grades in middle or junior high schools (as well as in more advanced grades in high schools). For this reason, school characteristics cannot be interpreted as characteristics of high schools, or even of schools including high school grades.

11 In British Columbia, the average income of individuals was higher in the urban communities, but this was not a statistically significant difference.

12 This analysis was focused on Grade 10 students in rural schools.

13 These considerations were weighed against the fact that the sampling fraction of the number of schools in many provinces approached a census. Although sampling fraction was not considered here for consistency with previous PISA analyses, adjustment for the sampling fraction of schools would have reduced the variance estimates for many jurisdictions to be near zero.

14 Although it did not change the properties of the model, the elements of G02 were reversed, such that the intercept G00 refers to the average predicted grade 10 performance in rural Alberta. This adjustment simplified the interpretation of the final model.

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